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ABSTRACT

The entire state of cable television, with particular emphasis on its educational effects and uses, is discussed. The interaction of society with emerging technologies is related to the effects of those technologies once firmly intertwined in society. A short history of cable television is presented along with the terminology and other details of community cable systems. A substantial report on the many different cases of local cable systems is given with a long review for each case and an address for interested parties. Next there is a general discussion of the finances of cable television and then a view of the likely future development. The paper is designed to serve as a guide for educators and town planners in the field of cable television. (WH)

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Cables, Cameras and Schools

Working Paper No. VI

The Impact of Communications Technology on Educational Systems in New and Renewing Communities

by

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and

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with the assistance of

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and

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May, 1974

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I.

Introduction

I.

Introduction

This working paper attempts to deal with some of the problems and opportunities presented by the combination of new communities with the advent of new forms of educational telecommunications technology, most particularly telecommunications by cable.

Since this topic is so large and difficult, this paper deals at length mainly with a much smaller part of that total problem -- the relationship between the new town school system and the rest of the community as that relationship is or could be affected by telecommunications and particularly by the cable. Thus, just as we do not pay primary attention to the uses of telecommunications as they are or could be used simply within the schools themselves, we do not deal at any length with the general, non-telecommunications aspects of educational technology in actual schools.

We do not pretend to have all of the answers in so complex and swiftly changing a field, nor do we claim even to be experts. We have had the help of experts in the preparation of this paper. In January, 1974, the EFL-OE project convened a group of knowledgeable people from a variety of educational and telecommunications fields. Their names are listed in Appendix A. These people spent two days in Reston, Virginia, discussing the present capabilities and future possibilities of telecommunications and education in new towns. Although they provided us with much information and many provocative ideas and although they read a first draft of the paper and reacted to it, they should be held blameless for any gross errors or misconceptions. Those -- if they exist -- are the sole property of the authors.

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II.

Where Are We?

II.

Where Are We?

Science tells us that the evolution of man can -- and perhaps must -- be seen as a complex interaction between the development of the human brain and the simultaneous growth of human technology.

It has been, we are told, our unique capacity to adapt and evolve mainly through the development of tools rather than through a reliance on bodily changes that most clearly distinguishes us from other members of the animal world. Our history has been essentially the history of this peculiar interaction, a process covering perhaps three million years. During those three million years, the size of the human brain (and thus presumably its intellectual power) has approximately tripled.

We have thus become "human" as a result of our capacity to conceive of, invent and use two interrelated kinds of technology:

- tools that extend and amplify the physical and mental power of the human body through acquiring and putting nonhuman sources of energy to work for us. From the first tools fashioned from stone, wood and bone to the highly sophisticated modern tool kit that includes steam engines, automobiles, airplanes and computers, we have gradually acquired the knowledge of and put to use the energy contained in fire, wind, other animals, water (hydraulic and steam), fossil fuels, electricity and most recently the atom itself.

- social and intellectual inventions, such as group hunting, agriculture, animal husbandry, writing, cities and modern science, that reorganize and transform societies. These inventions extend the capacity of individuals and groups of individuals to support larger and larger human populations and to develop ever more complex and sophisticated systems of tool technology.

One of the more recent of these social inventions has been the device of formal education and the institution of the school, which is only about 5,000 years old and which followed closely upon (and was probably in large part necessitated by) advances in the technologies of writing and numbering.

Since those early days, schools have themselves become prime consumers of increasingly sophisticated technology.

The first schools in Sumeria appear to have been limited to the cunieform wedge, clay tablets, the fires for hardening them, a room for storing them (the first library) and the inevitable rows of tables and benches. The modern schoolhouse contains -- in addition to pencils, pens, paper and rows of desks and chairs -- blackboards, chalk and erasers, printed materials of all kinds (books, maps, charts, posters), typewriters, telephones, clocks and buzzers, science and language laboratories, food preparation and service equipment, gyms, Xerox machines, rubber bands, blocks, Monopoly sets, cameras, television sets, animals, radios, machine shops, film projectors and mimeograph machines. In this sense, the typical American school is drenched in tool technology, almost all of it inverted by nonschool people and imported into the educational system.

While we are all users and sometimes inventors of technology, many people have become increasingly concerned, at least for the past fifty years, about what seems to be our inability to control -- or even to foresee -- the consequences of technological invention. It appears to some that the human penchant for inventing ever more complex tool systems -- always a mixed blessing at best -- has acquired a life of its own, that we are in danger of becoming the victims of our own ingenuity.

Watt's steam engine ushered in not only the industrial world, but also universal pollution. Eli Whitney's demonstration of the efficiencies of interchangeable parts and assembly line production has given us not only the refrigerator, the automobile and the skyscraper, but also the Saturday night special; the brutalizing General Motors plant at Lordstown, Ohio; and a worldwide petroleum crisis. Marconi's radio, Edison's camera and Philo Farnsworth's television have provided us not only with "Grand Illusion," "The Seventh Seal," "Sesame Street" and the drama of Watergate, but also with "I Was a Teen-age Werewolf," the cute Nazis of "Hogan's Heroes" and the visual huckstering of the video commercial.

It is not likely that Marconi, Edison or Farnsworth ever sat down and attempted to foresee all of the consequences of their inventions; or that Henry Ford envisioned the day when his automobile would be castigated as a criminal polluter and one cause of a national energy shortage; or that Albert Einstein could necessarily foresee that his formulation of the relationship between energy and matter would lead to Hiroshima and to vast arsenals of nuclear weapons. Indeed, most of these people saw their discoveries and inventions as potential boons to mankind, as ways of making the human condition more tolerable and perhaps even more humane. Three recent and notable exceptions to this rule would be the working technologies of atomic and nuclear energy, the liquid fueled rocket and the modern electronic computer, all of which came out of a desire to fashion more effective weapons during World War II.

The situation is quite different now. Although technological development continues at a rapid pace, there is a general concern about the possible effects -- environmental, social, political and economic -- of elaborate new technological systems. A landmark event in this drama was probably the conflict in this country over the supersonic transport which led us, for perhaps the first time, to hold a national debate on the wisdom of proceeding with a clearly feasible technological "advance." The SST battle was fought on fairly narrow grounds -- possible dangers to the environment and whether it was really necessary and worth all that money to get to London in four rather than eight hours. The battle was fought and won -- at least temporarily -- by those who attempted to foresee what all of the possible consequences of a new piece of technology might be.

A much more important debate is now underway over the future of what is called "telecommunications," the entire panoply of devices that includes radio, telephone, television, satellite communications systems, computers linked by telephone and cable (including computer-aided instruction) and, most notably of all, the bi-directional or two-way, multichannel coaxial cable capable of tying together any or all of the other parts of the system.

As with so many other technological innovations, there has been a great deal of unrestrained heralding of the many and revolutionary benefits that could flow from the development and widespread use of telecommunications technology. The advocates of its far-flung adoption see it as a possible way of solving many of our most pressing problems. Telecommunications have been touted as making major breakthroughs possible in information processing and distribution; in the way we operate local governments; in police and fire protection; in health services; in transportation (by cutting down on the necessity for travel); in land use and settlement patterns (by making it possible for people in rural communities to have access to more urban amenities); and, of course, in large-scale improvements in the delivery of all sorts of educational services. Some of these educational promises and possibilities are discussed in greater detail in the following chapters.

In 1971, the Committee on Telecommunications of the National Academy of Engineering prepared a report for HUD setting forth the kinds of communications systems that are now technically feasible:

> "1. A telephone network for transmitting pictures, voice, and written material between two points.
>
> 2. A network based on existing cable television systems, which can distribute information from central facilities to offices and homes, with a capacity of as many as thirty television channels and a limited call-back capacity for polling or making requests.
>
> 3. A broadband communications network carrying up to thirty equivalent television channels in both directions interconnecting major public institutions and large commercial enterprises.
>
> 4. A multipurpose city sensing network to collect data on such items as weather, pollution, traffic, vehicle location, and power status."

The NAE report concludes:

> "...many of the cities' problems are caused by high density living conditions in an era of increasingly rapid change. Communications technology, imaginatively applied, could offset the trend in which the vast majority of Americans today, and more in the future, live on a small percentage of the available land.
>
> "We suggest an exploratory program to examine how broadband communications technology could be applied to business, government, education, health care, and entertainment to stimulate the development of existing small communities, or new communities in rural areas. As a result, people would have a viable option of settling in either urban or rural America."

This kind of thinking has led to the concept of the "wired city" and eventually to the "wired nation." The nation, of course, is wired now. Indeed, we have been wired three times already, once for the telegraph, once for home electricity and again for the telephone. This fourth wiring refers to the universal hookup involved in cabling the country so that every American home would have access to both local and national telecommunications systems. The first field test of the "wired city" idea is now getting underway in Stockton, California, supported by the National Science Foundation and using the local cable operator (Continental Cablevision) and the MITRE Corporation's TICCIT system (see chapter IV B for a more detailed description). In a staff paper produced by Complan Associates, Inc., for the President's Task Force on Communications Policy, it has been estimated (and it must be the roughest of estimates) that the hardware cost for wiring the United States would be $1.3 trillion ($1,300,000,000,000). This does not include the money necessary for software development.

By and large, the literature on the telecommunications "revolution" has tended to emphasize the positive benefits that might flow from such a large investment in time, energy, labor, raw materials and the gross national product. It is, in general and once again, a matter of the interested parties attempting to spell out the possible gains, breakthroughs and benefits as well as the problems that might be solved by the development of this form of technology. There have been questioning and even dissenting voices raised all along the line, but the bulk of the energy expended so far in the field has gone not only into solving the technical hardware and software problems, but into attempting to convince the general public, the government and private industry that the entire effort is worthwhile.

It is interesting to speculate what the country would be like now if there had been a comparable national debate at the turn of the century over the introduction of automotive technology. Would it have been possible then to foresee all of the consequences -- beneficial and not so beneficial -- of a personal transport vehicle powered by an internal combustion engine using gasoline as a fuel? Would we -- could we -- have predicted the enormous changes in American life that were to come about because of this one fairly simple technological innovation? Could we have foreseen the growth of suburban and exurban sprawl based not on rapid transit but on the almost unlimited mobility provided by the automobile? Could we have predicted the staggering investment in roads (including the interstate highway system); in the gasoline industry; in armored automotive weapons; and in farm equipment (including the increase in agricultural productivity that resulted)? Could we have foreseen the eventual decline of the railroad, the problems of pollution and the energy shortage?

The chances are that we would probably have predicted few of these things. As the ancient Chinese sage put it, "It is very difficult to make predictions, especially about the future." Indeed, when a Parliamentary Commission was established in England late in the 19th century to study, make predictions and give advice about the wisdom of introducing electricity on a general scale, the conclusion reached by the Commission was that this was not an invention that would ever turn out to replace the gas light, except perhaps in the homes of the very rich.

The current attempts on the part of some segments of the communications industry to spell out the benefits of telecommunications include a considerable emphasis on the possible revolutionary effects such technology could -- and perhaps will -- have on the ways we educate people. This kind of thinking takes many forms and covers almost every aspect of learning, from preschool through continuous adult education. Attempts have been made by McLuhan and others -- and they cannot be lightly dismissed -- to equate the introduction of telecommunications with the invention and introduction of writing, at least in terms of its possible impact on society and on the processes of education.

For example, some of the most advanced "blue sky" thinking about new towns and education was done for the apparently ill-fated Minnesota Experimental City (MXC), the totally new, free-standing city for 250,000 that has been -- or was -- proposed to be built in a relatively uninhabited section of Minnesota. The original planning document for the educational system of MXC, in addition to spelling out a large number of far-reaching educational innovations, has this passage concerning "The Importance of Educational Technology":

> "Since technology in the new city will draw heavily on technological resources in its total-systems approach to planning, it will be worthwhile to examine how technology can further learning. The present-day information explosion will not lessen with time. The problem is and will continue to be how to digest, catalogue, and retrieve the vast amount of factual information in almost any discipline.
>
> "Development of the computer as a random-access storage and retrieval tool promises to provide the means to handle vast quantities of information and thereby create a new industry: the information services industry. Business analysts tell us the potential of the computer in this field has hardly been realized. Computerized libraries and files should take on

significance for scholars, researchers in all disciplines, business analysts and forecasters, professional people such as doctors and lawyers, and social service providers.

"Some potential roles of information services in MXC now under consideration can be summarized as follows:

Commercial and institutional bibliographies:
- MXC as a location for development of software and proving ground for applications
- MXC as a clearinghouse for social science information and social research centers

Public market information services:
- MXC as a trial market and proving ground for microform publications
- MXC as a trial market and proving ground for video cassettes
- MXC as a location for publication of regional and other special interest publications
- MXC as a location for production of low budget video cassette programs

"The application of information services and new communications technology to provide opportunities for new forms of teaching and learning takes on several dimensions.

"The use of video cassettes and microform equipment will make it possible to get information, the raw material of education, to the learner who will not be confined to a particular location at a particular time to listen to a lecture. The widespread application of teaching machines and other advanced techniques should follow the pattern which has emerged to date.

"The great potential of these educational techniques, however, lies in their ability to break the institutional pattern which has made it difficult for many to gain access to education and training.

> A possible pattern for this breakout would be the development of community learning centers open to the public where those who wish could take specific courses at times to meet their needs. An open university, national in scope, has been established in England with full accreditation. A faculty located at the university teaches courses to students all over England on three channels of BBC. One channel is devoted to regular course instruction, another to intensive instruction on that subject, another to an abbreviated version. This concept, subject to substantial refinement available through advanced communications technology, has great potential for application to the MXC educational system on a city-wide and regional basis.
>
> "Our research into educational services as a commercial enterprise leads us to express some caution. When computer technology advances to the stage when services will be economically available to the private citizen, educational services can move from the institution fully into the home. Whether such advances -- not in technology but in production which cuts unit costs to levels most private citizens can afford -- will occur by 1985 is not clear yet. Certainly some decentralization to community learning centers and use of automated techniques in schools will be feasible on a large scale before the end of this decade.
>
> "Companies in the following existing industries either have entered the field or are highly logical candidates: publishing (books and periodicals); computers; broadcasting (cable TV); service conglomerates. These are all industries judged in our economic base study as having growth and innovative potential, preferring to locate near a university and similar industries, and having base production characteristics compatible with candidate sites for the new city."

The actual history of telecommunications and education is not such as to inspire a great deal of confidence in either long-range predictions or the rhetoric of planners.

Although there was apparently not much thought given to the educational possibilities of the telegraph, the invention of the radio, the phonograph and motion picture film were heralded as "revolutionizing" the education industry. Special emphasis was put on two related possibilities: that now the great minds and best teachers of the world could be brought directly into every classroom over the air waves or recorded on disk and film; and that these devices now opened up a vast world of auditory and visual information that was hitherto inaccessible in printed form to the average student.

These three pieces of technology certainly did have a transforming effect on society and on making information available to everyone. But they have had almost no effect on schools. The reasons for this failure are numerous. They include some very simple and practical obstacles, including cost (at least in the case of film), scheduling problems and the simple fact that machines break down (at least in the hands of untrained human beings such as teachers) with frustrating regularity. Much more to the point, no doubt, are other possible reasons such as a fear on the part of teachers that they could or would be "replaced by machines," or a feeling of revulsion on the part of teachers and parents against what appeared to them to be a further "dehumanization" of the educational process; or a genuine feeling on the part of many professional educators and developmental psychologists that such technological innovations would at best have a minimal impact on the educational growth of children and were therefore not worth the investment in either time or money.

The twin arrival after World War II of television and the computer was once again hailed by their advocates as a coming revolution in schooling. A number of large corporations, most of them involved in manufacturing hardware, began to invest considerable sums of money in the development not only of new hardware (for computer-aided instruction, for instance), but especially of software, the programs that would be carried by, fed into or provided for the new machine technology. In many cases (RCA, General Electric, Westinghouse, as instances), this meant acquiring or starting companies to produce the software. Again, in almost all cases, the market has simply not developed while plain old book publishing has continued to flourish.

Instructional television (in or to schools as opposed to public "educational" broadcasting) has also not had a fortunate history. At least two major instructional TV experiments have been funded by education-oriented foundations to test the feasibility of schooling via the airwaves. One is the pioneering effort in Hagerstown, Maryland, in which for the past eighteen years the entire school system has been connected by closed circuit cable and every classroom has been wired. The second experiment was the Mid-West Program for Airborne Televised Instruction (MPATI) project which was based upon the idea of an airborne broadcasting studio housed in an airplane continuously circling over Chicago and its environs. The plane beamed a variety of instructional programs throughout the school day to all television sets within a radius of some fifty miles from downtown Chicago.

The MPATI experiment died of economic leukemia resulting not only from the high cost of producing adequate programs, but from the associated fact that school systems and teachers resisted the notion that the daily schedule of every classroom in the five-state area around Chicago would have to be dictated by what was emanating from the airplane. The Hagerstown experiment (if anything eighteen years old still merits the label of "experiment") is also having its problems (see Chapter IV B for a report on the current situation).

The most notable, recent and continuing venture in the instructional television field is, of course, the Children's Television Workshop which produces "Sesame Street" and "Electric Company." CTW is about to be joined by a series on mathematics produced at Educational Development Center under the direction of Jerrold Zacharias of MIT and will probably be joined in the future by other such shows in other fields. The great contribution of "Sesame Street" is undoubtedly that it appears to work. That is, children do look at these programs and do apparently learn from them. These shows do successfully compete with the 4,000th showing of "The Three Stooges" and "Lassie." They have been quite deliberately designed to do so on the theory, it has to be assumed, that one of the major problems with "educational" television BSS (Before "Sesame Street") was that it was so uniformly boring. It was, some have said, just like school and therefore doomed to defeat if forced to compete with any commercial product, including the commercials themselves.

It could additionally be argued that one of the more significant problems that has dogged instructional television and still harasses the entire field of educational technology is precisely the fact that it is so resolutely conceived and executed within an "instructional" framework. The educational model almost exclusively adopted by most producers of educational hardware and software has been the accepted one of information and skill transmission.

Despite the technological wizardry of television sets, cameras, computers, wires and what not, the "education" offered is still the venerable process of attempting to transmit the knowledge or skill (or both) that resides in a knowledgeable and usually older head into a less knowledgeable and usually younger head. And the most ubiquitous piece of technology used is the most ancient weapon of them all, the device Harold B. Gores has referred to as "the jawbone of the teacher."

Instructional technology, whether it comes in the form of a televised lecture or an elaborate documentary on the origins of man or a computer that knows a child's name and talks back at him, is currently most often used in a fashion that attempts to make the basic learning decisions for the learner. It tries to tell him what and how to learn and, in most cases, when to learn, just as it attempts to govern the way teachers teach. This is not the only way educational technology can be (or, for that matter, is) used, just as "instruction" is not the only or perhaps even the most effective way to educate people. Few would deny that information transmission (or at least the availability of information in some easily transmittable form) is an essential part of education. This is what the printed book is all about. Elaborate forms of electronic technology can also be used this way, to give the learner access at any given moment in time to the exact information or skill training he needs exactly when he needs it.

But the acquisition of necessary information and skills is only one part of the larger educational process. Most contemporary views of human development and thus education lay great emphasis upon the acquisition of knowledge and skills through action on the part of the learner; through becoming involved in the solving of real problems; through making choices and decisions; through using relevant information to make internal transformations in one's own mental structures. As we shall see later on, this more active and less "instructional" approach to learning can and does make use of educational technology in some interesting and economical ways.

The most important and currently the most debated advance in telecommunications is the bi-directional or two-way coaxial cable that can carry 40, 50 or even 90 separate channels. The first virtue of a cable is simply that it provides better reception for viewers in those areas of the country that do not receive adequate over-the-air pictures with normal antenna equipment. A large antenna connected to the area's television sets by cable can bring good reception to homes in outlying rural and suburban areas -- and also in those larger urban areas (such as New York City's Manhattan Island) where tall buildings interfere with normal reception. Some 6,100 communities in this country are now cabled in this fashion, including some of the new towns covered by this project. (See Chapter IV A for a detailed rundown on the current extent of cabling in both old and new towns.)

The cable movement began in earnest some ten years ago. Again, the advent of cable was accompanied by a great deal of advance rhetoric about this new technological wonder. Perhaps the single most important argument advanced in favor of cable has been the argument of access. The multichannel cable, it seems clear, does make it technologically possible for a television viewer in a home or a school to gain access to a wider variety of programs than is possible with over-the-air broadcasting. A viewer in the Greater Boston area with reasonable antenna equipment, for instance, can receive four local VHF channels (the three networks plus WGBH, the public channel) and also two to three more distant VHF channels (again carrying mostly network shows) as well as four UHF channels, making a possible total of eleven options.

This is a far cry from twenty or forty options that could be available on a cable. In addition, most of the over-the-air stations, since they are run as strictly commercial enterprises and have to serve a metropolitan audience, are not going to serve specialized minority audiences. They are, by and large and with the exception of the public stations, going to put on the air what sponsors are willing to pay for, which in large measure is going to be what most of the people in any given area want to see, or what the managers of stations believe most of the people want to see.

What the cable advocates claim to offer is a way of broadening the range of options available, of making it possible in theory for those smaller specialized audiences to have their needs served and also to get their minority views on the air. Since March, 1973, the Federal Communications Commission regulations have required that cable television operators must provide a two-way capability and also set aside three channels for public access use -- one for the direct use of community groups, one for governmental use and one solely for educational purposes.

This arrangement opens up all sorts of theoretical possibilities. It makes it possible, for instance, for residents of any given cable franchise area to make local decisions about what is going to be seen on at least three channels without the interference of commercial interests. Again in theory, it could mean giving local people the possibility of greater access to those people or groups in a community who are making the decisions that affect local life (combatting the "Who's doing me in now?" syndrome). Town meetings, meetings of boards of selectmen or city councils or boards of education could be broadcast live directly into the homes of all citizens who cared enough to switch from Archie Bunker to the local mayor. Citizen and community groups in a local area could get their viewpoints -- supportive or critical -- on the air and into homes. And the school system -- teachers, students, administrators -- could also have direct linkages not only between schools, but between schools and the rest of the community.

The "two-way" capability also makes it possible -- with the addition of a terminal in the home -- for the home viewer to respond to what comes on the screen, whether this be simply a "yes-no" response for polling or instant voting or a more elaborate system of visual and auditory response back and forth between a home viewer and a distant computer providing computer-aided instruction. Many of these ideas are already being tested in various forms all across the country, and other such tests are being planned.

All of these possibilities raise a host of intriguing and important questions not only about the advisability of doing or not doing all these things, but especially about the feasibility of paying for them to be done. If such "public access" capabilities -- both the hardware and the programming that must go with it -- are to be realized, then someone, somehow, is going to have to figure out what the minimum costs are and how it is all going to be supported without the intrusions and constraints (and the dollars) that come with selling air time. The same questions of economic feasibility are also there to be answered -- but on a much larger scale -- for the entire field of instructional educational technology. Who is to pay not only for the hardware, but for the vast warehouses of software that would be necessary to make a national system of instructional technology work?

The advent in this country of the comprehensively planned new community has, at least to many people, seemed to provide as close to an ideal setting for telecommunications experimentation as could possibly occur. This has been true not only in telecommunications, but in education itself. Such experimentation does fit with the "urban laboratory" strain that runs through the new town movement and which has been discussed at some length in this project's other working papers. Most new towns are either cabled or are in the process of being cabled. All new towns have educational systems of one kind or another. What is the proper relationship between these two facets of new town life? What are the problems and possibilities?

This working paper, then, attempts to explore one small aspect of the much larger and even less manageable problem of telecommunications experimentation in the setting in which one might expect some questions might be answered and some problems solved -- comprehensively planned new communities in which telecommunications can or could be built into both the planning and the structure of a human habitat right from the start.

The main aim of the paper is, obviously, not to be the last word on the subject, but rather to set the whole question in some kind of manageable framework for school people and for planners of educational systems in new towns. We also hope to provide, in addition to a few of the right questions and some useful information, a set of suggestions or guidelines or possible ways to approach the whole problem, again with the harassed local school district people and new town planners in mind. We believe, too, that the lessons learned from the new town experience will have enormous value for old towns and big cities as well.

Our ultimate advice may seem excessively cautious and unadventurous to some, but experience appears to show that while glib rhetoric is fairly cheap, the results of an unthinking acceptance can be extraordinarily expensive. As a nation and as a species we have perhaps too often happily embraced every new bit of technology as it happened along without subjecting our innovations to the painful scrutiny of reason and foresight. The time may be well upon us when we can no longer afford such easy luxuries. History -- or rather the forces of natural selection -- may be carrying us beyond some ill-imagined point of no return. If it is true that our physical resources of energy and raw materials, including food, really are in danger of approaching exhaustion, if indeed we are not able to exert some control over population, pollution and mindless industrial growth, [illegible] caution may be only the smallest virtue we need to call upon.

III.

Cables, Head Ends and Terminals: A Brief Review of Communications Technology

III.

Cables, Head Ends and Terminals: A Brief Review of Communications Technology

The term "communications technology" encompasses communications media ranging from the telephone and the television, to millimeter wave guides and laser transmission. Among all of the possible tools of communications technology, cable television (CTV) offers the most interesting problems and possibilities for education and development in new and renewing communities. Of the numerous major new communities constructed, under construction or in the developmental stages in the United States, most have either laid a trunk cable or are planning to include one in their development (specific examples are described on page 47).

However, the initial excitement surrounding the phenomenon and development of communications technology more than a decade ago has turned to caution today. Cable stocks, for example, are no longer considered glamour stocks; cable companies no longer clamor to bid for new franchises; reduced operating budgets (due to low and unsteady subscription levels) have forced managers to depend even more heavily on voluntary assistance in programming. Given today's more subdued interest in the potential miracles to be accomplished by cable television in particular and technology in general, it seems advisable to concentrate on how to take full advantage of the cable resources we have in place rather than to worry too much about the implications of future innovations in technology.

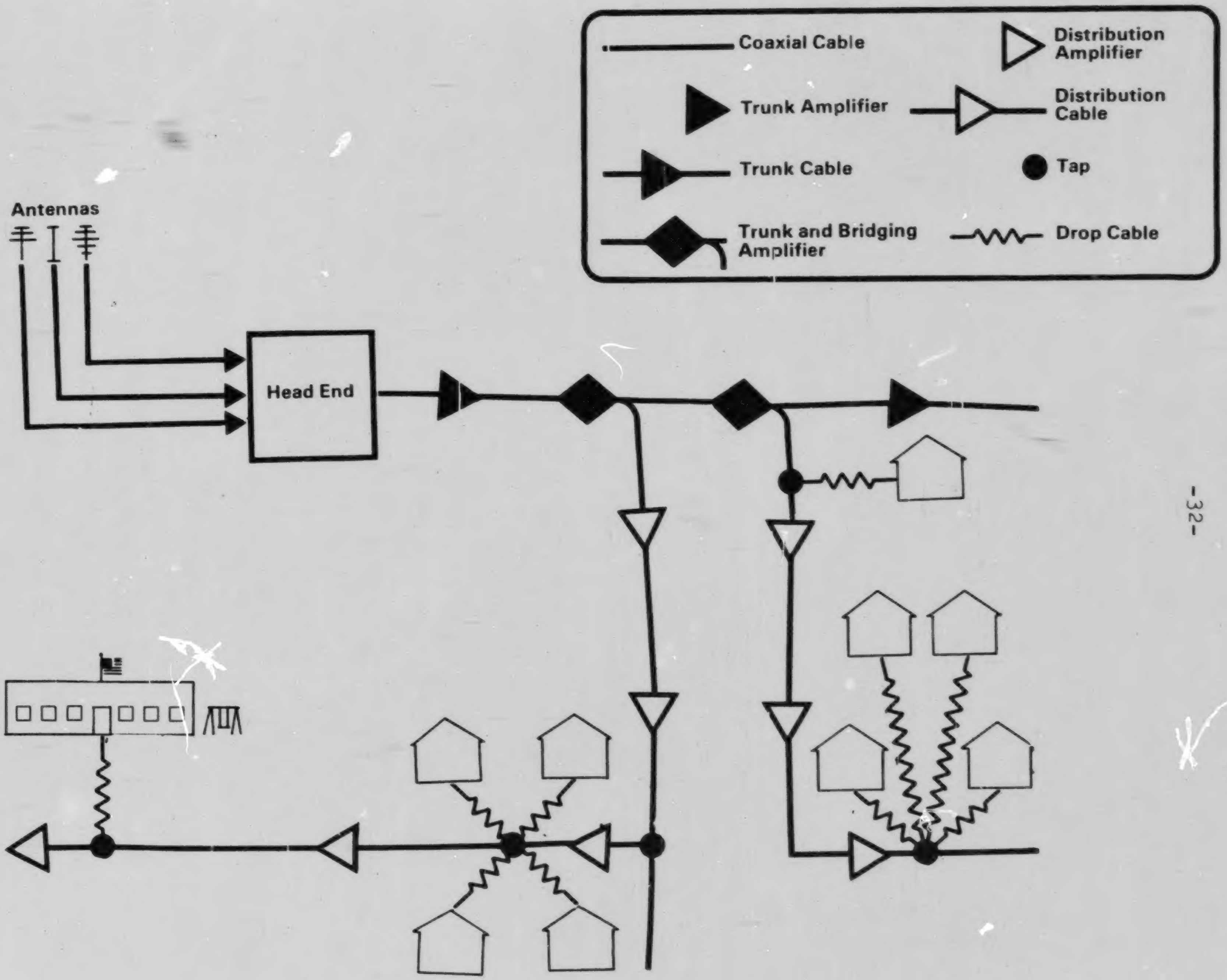
Cable television systems provide a vehicle for the distribution of many other forms of educational technology. Whether or not the various communications technologies can ever be combined in an educationally and economically responsible manner is open for much speculation. Coaxial cable has the potential, however, for making computer technology easily accessible to large numbers of people, and computers offer educators an incredible resource for the instantaneous processing of enormous quantities of information. PLATO and TICCIT are two important experiments dealing with the possibilities and problems of computer-aided instruction. PLATO IV, a project of the University of Illinois, plans to link a thousand time-shared terminals to a large central computer. Minimally, PLATO uses telephone line to transmit information between the computer and the user. When tied into a cable television system, PLATO is able to provide a greater range of services. A MITRE Corporation project called TICCIT will be expanded and tested in Stockton, California. The TICCIT computer system will be connected to 1,000 terminal viewing stations by means of a coaxial cable television system.

Cable television and computers can also be combined with video reproduction, the technology of storing miniature talking pictures on tape, disks or film either for replay at one's convenience or for immediate reproduction. This is the technology which makes possible the facsimile reproduction of newspapers over long distances.

The actual process of receiving and transmitting signals by a cable system is neither mysterious nor complex. It simply provides a way of moving messages from one place to several others at the same time. Traditional cable systems receive VHF, UHF and FM signals from the air and transmit them on a coaxial cable throughout a community. Basically and simplistically, the components of a cable television system consist of a cable, a head end and a terminal. The diagram on page 32 illustrates the process of transmission from antenna to television.

A. Cable Basics

1. Cable: The most rudimentary element of a cable system is the coaxial cable. Essentially, a coaxial cable consists of a single inner conductor, a layer of insulation and a tubular outer conductor. The signal is transmitted through a trunk cable


Coaxial Cable
Trunk Amplifier
Trunk Cable
Trunk and Bridging Amplifier
Distribution Amplifier
Distribution Cable
Tap
Drop Cable
Antennas
Head End

which consists of a large coaxial cable 3/4" to 1" in diameter that can be buried in the ground or strung aerially on telephone poles. It enables the transmission of signals free from the interference that sometimes plagues over-the-air broadcasting. Although cable television systems are generally planned to carry thirty channels, under FCC regulations, cable systems are obliged to carry only twenty channels. Given certain conditions a coaxial cable has a theoretical capacity of ninety television channels. It is technically, however, very difficult to program that many channels successfully. Currently, it certainly does not seem practical to do so since there is not an excessive amount of programming available by any means.

The cable is strung out across a community in a manner similar to the roots of a tree. The trunk cable is laid first and distribution cables, generally smaller coaxial cables, are run from specific points in the trunk cable to serve subscribers in a particular area. Since signals diminish in strength as they travel down the cable, trunk amplifiers are located at regular intervals along the trunk to boost the signal. A tap is used to connect homes, schools, community centers, etc., to drop cables which feed into the distribution cable. The tap isolates the drop from the distribution cable to avoid one subscriber's reception being disturbed by possible short circuits on another subscriber's drop.

The coaxial cable itself is relatively inexpensive. It costs approximately $800.00 to $1,000.00 per mile for trunk line (two-way cable). Its installation also can be fairly reasonable if it is undertaken simultaneously with the construction of streets and sewers and the burying of underground telephone lines. When a cable system is buried in the same trench with underground telephone cables, the excavation costs are shared with the telephone company. Most developing new communities are laying the cable along with the utility lines as new neighborhoods are constructed. The actual installation cost depends upon the expense of trenching.

If, however, a cable system is desired in an already existing community, the installation costs are much greater. The cable can be strung on telephone poles. The telephone company, however, charges rent for the use of their poles. If streets and sidewalks have to be torn up, the cost of burying the cable system is extremely high. If there is any intention whatsoever of having a CTV system in a new community sometime in the future, at least the conduits if not the actual cable should be laid at the same time the other utilities are being installed.

Most of the cable systems being developed in new communities today are installed with two trunk cables. This, plus the addition of the necessary amplifiers, offers the possibility for the two-way transmission of signals when and if a demand for two-way communication should develop. The second cable can also double home reception by providing an additional thirty channels. Since, at present, the single cable provides more than adequate capacity for most communities, the second trunk is not activated until it is needed.

2. Head End: In a fairly simple system, the head end includes a tower with individual antennae which pick up off-the-air signals for each channel so that antennae characteristics can be matched closely to channel frequencies. The signal, received by the antenna, is amplified to bring it up to maximum strength and clarity before sending it down a cable

to the head end. From the head end, the signal is transmitted to individual terminals. In a more elaborate system the head end might also include an origination studio equipped to produce and to transmit its own programs.

3. Terminal: Minimally, the terminal is a conventional television set in a home, classroom, community center, etc. It might include a video monitor with a device to tape and replay an incoming program; a subscriber response terminal with buttons for returning audio signals; or a sophisticated terminal for receiving and sending audio and video signals.

Usually, a CTV system is privately owned and operates within the legal constraints of a franchise awarded to it by the municipality or county in which it is located. It is owned by a company in the business of providing various types of services to the community for a fee. Its basic raison d'être is profit, and the sophistication of the hardware and the range of services offered vary greatly from one company to another.

The simplest system is nothing more than a community antenna service. In rural areas of the country where over-the-air reception is poor due to mountains, valleys and distances from major broadcasting centers, the cable company constructs the antenna, amplifies the signal and sends it crisply and clearly down the cable to its viewers. [In fact, Community Antenna Television (CATV) got its start twenty years ago when a television repairman in a hill-locked Pennsylvania town installed an antenna on a mountain top and connected himself and his neighbors to it by cable.] In order to receive this service, a family must pay a nominal installation charge of approximately $20 for cable connection (this figure varies depending on the difficulty of installation) and a monthly subscription fee ranging from $5 to $12. The monthly fee depends upon such factors as the number of channels provided, the extent of the programming and the local franchise conditions. The gross receipts from these subscriptions are then used by the cable company to pay off the amortized high front-end costs for cable, installation, antenna, studio, etc.; to cover operating costs; and eventually to generate some kind of profit.

More sophisticated cable television sytems have the capacity to originate their own programs, In some cases, an area will have several CTV systems owned by a larger parent company known as the multiple systems operator (MSO). One of the systems might be equipped with a fairly sophisticated studio capable of programming its own local shows, movies or sports events. These programs are then transmitted by microwave to each of the individual cable systems, picked up by the antennae, amplified and sent down the cable. In this manner the programming offered by each of the individual systems is greatly expanded. Teleprompter, the largest MSO in the country, owns 145 CTV systems with a combined audience of 750,000 subscribers. Through the use of its own satellite, Teleprompter plans to develop the capacity to link all of its systems into one in order to provide special programming services.

The quality and sophistication of origination studios vary widely. Choosing studio equipment is analogous to choosing between a $10.00 Brownie Flash or a $700.00 Hasselblad with a complete set of lenses -- both "take pictures." A minimal black and white studio can be fully equipped to handle high quality transmission and programming. A color studio runs from approximately $50,000 to $150,000. A mobile color studio which can transmit live programs from various sites outside the studio (assuming on-site connection to the trunk cable is possible) can be purchased for $70,000 to $90,000.

The following inventory of equipment with its associated possible cost figures outlines the basic items needed to equip an origination studio:

1. Camera ($800): This includes a camera, zoom lens, tripod and microphone (usually built into the camera).

2. Video Tape Recorder (VTR) ($800): A video tape recorder serves the same function as an audio tape recorder but does it with images. SONY has a product called a "Porta-Pak" which includes a camera and a small battery-powered video tape recorder that is carried over the shoulder...price for the set is $1,700.
3. Video Tape Recorder with edit capabilities ($1,200): This allows recorded video tape to be played back and edited.
4. TV Receiving Monitor ($300): This piece of equipment is plugged into a VTR and projects an image on a screen so that a viewer can see what to cut and what to keep.
5. Modulator ($1,000): The modulator converts the taped or live images into a signal that can be sent down the cable.
6. Lights ($100): Floodlights, etc.
7. Additional Audio Equipment ($100): Additional microphones and amplifiers are needed often to cover situations that could not be handled with microphones mounted on cameras.
8. Video Tape ($100): A reel of 1/2" video tape which will allow for 1/2 hour of recording costs approximately

$15. A 3/4" tape, which is preferable for reasons of quality (assuming one has the equipment), costs about twice as much. Video tape can be erased and reused just as audio recorder tape can be reused.

This list of equipment represents the bare essentials needed to originate programs. It is fairly crude when compared to expensive consoles that allow one to "orchestrate" a program. These more elaborate consoles allow the operator to edit a tape by viewing simultaneously four different images of the same subject. With the flick of a switch one is able to select the preferred image and blend in the desired audio signals. This basic equipment, nevertheless, does enable video tape to be shot outside a studio, edited with studio equipment and transmitted by cable. It also permits live programs to be produced from the studio.

B. Upstream-Downstream

A CTV system with a dual cable and the necessary equipment at both ends can be used to transmit "one-way" signals ("downstream" from the head end to the many terminals) or "two-way" signals ("downstream" and "upstream" from the head end to the terminal and back to the head end).

There is a tendency in any discussion of new cable systems, especially in relation to new communities, to spend an inordinate amount of time in speculation about how to prepare for the new two-way technology of the future. This occurs usually at the expense of considering how to take advantage of the one-way capability that already exists. The two-way use of cable is confined to a relatively small number of experimental systems. This is due primarily to the high costs involved and to an uncertainty as to exactly what services a two-way system might provide. In contrast, "one-way" systems are in operation in virtually every part of the country and have accumulated years of experience in delivering educational and community services to their subscribers.

At present, the upstream transmission of signals from one terminal to the head end (or to other terminals) remains in the experimental stage. The obstacles are more economic than technological, however. Terminals have been developed that allow the viewer to press a button and to send a signal back to the head end. This technology has innumerable possible applications. A camera can scan the shelves of a supermarket and from a television set a shopper can demonstrate his or her preference by signaling every time a desired item is passed. Similar terminals hooked up to sensors in homes, schools or businesses can send signals to indicate fire or illegal entry. With the appropriate head end equipment, certain terminals placed in schools (or homes) permit students and teachers to dial for information tapes to be played back to them from a library of video tapes.

Of particular interest is the potential of using subscriber response terminals to conduct public opinion surveys. For example, the proceedings of a town council meeting can be transmitted over a cable, and viewers can express their opinions on various issues by signaling with their terminals when the polling begins. The totals can be tabulated immediately and the resulting expression of local sentiment could be included among the factors that influence the final decisions of the councilmen. It is not hard to think of the difficulties inherent in this kind of instantaneous participatory democracy, especially since the most important decisions in this country are too often made behind the closed doors of smoke-filled rooms. Leaving the political question aside, public opinion surveys through two-way cable are technologically quite possible.

The ultimate in the two-way use of cable television has not yet arrived, primarily due to cost factors (although there are also some technological problems relating to cable capacity). The ultimate would turn every home, school, business and community facility connected to a dual cable into a mini-origination studio capable of transmitting video signals to any other facility connected to the cable (either directly or through the head end). Presently, the equipment necessary for the origination of a video signal, as we have seen, is far too costly for the average household. Nevertheless, it is technologically possible for an individual household's television room to second as a transmitting studio. Children could receive their classes from school and talk with teachers on specific days when travel to school was difficult. (Some school districts worried about the availability of gasoline for buses are considering ways of using their present one-way cable systems to deliver classes on certain days. The fact that not all homes are connected to the cable, however, limits the application of this solution.) The breadwinner of the family could dial all of the other members of his or her "office" (a term which would begin to lose its spatial connotation as would many other words -- "school?") and spend a hard day at work in front of the tube.

IV.

Educational Telecommunications and New Towns

IV.

Educational Telecommunications and New Towns

A. The State of Cable in New Towns

For various reasons, most new communities have or are planning to have a CTV system. The presence of cable television in new communities seems to be due primarily, however, to the profit motive rather than to any altruistic interest in the educational potential of the resource. The problem with respect to the educational use of these systems is not necessarily related to the absence of hardware but rather to the limited use of the hardware that does exist. This section will review the CTV facilities in place or proposed for several new communities. It will become clear that, where CTV systems already exist, they are languishing for lack of commitment from the cable manager, the school people and/or the city at large to work together. Where the systems have not yet been built, it is difficult to say what will happen. Taken together, however, all of these systems could represent a tremendous educational resource -- if they catch on.

Among the numerous reasons for including CTV in new communities is the fact that many new towns are located twenty-five or thirty miles outside of a major city. Therefore, commercial television reception can often be improved (especially in hilly areas) through the use of a cable communication system. If the new community is located downtown, a CTV system can reduce poor reception caused by interference from tall buildings.

A more persuasive reason for developing CTV lies in a new community's population projections. A new community population generally includes between 30,000 and 150,000 middle and upper-middle income residents and often lies within or nearby larger suburban communities. The potential market (at least in the long run) offers considerable promise to a cable company. In some cases, a portion of this market is even "guaranteed." In Reston, Virginia, the apartment units are automatically hooked to the cable, and monthly subscription fees are included in the rent.

A third reason for including a cable television system in a new community lies in a developer's interest in building amenities into his product in order to compete with and surpass the houses put on the market by other developers. Therefore, CTV antenna reception; centrally monitored fire and illegal entry warning systems; and local CTV origination studios are becoming -- like power steering in American cars -- almost "mandatory options" for new towns. Finally, the fact that new communities usually begin with undeveloped land adds the incentive of laying the cable along with the utility lines at a reduced cost.

On the other side of the ledger, however, there are good reasons why a cable operator might think twice before considering soliciting a franchise in a new community area. Most problematic is the question of how large a potential CTV market the new community can offer and when that market will really and truly materialize. If, for example, the new community is to be built in a rural area with few other nearby developments, the cable company will be dependent solely on the developer for providing an adequate market. If the developer fails to meet his construction schedule or if he "goes under," the cable company will be left with a market a fraction of the size of the one on which it based its financial projections. Relevant to this problem is the added dilemma of a limited number of subscribers during the early stages of a new town's development, the period when only a few neighborhoods are ready for occupancy. In contrast, a CTV company which begins work in a city starts with its potential market already in place.

In general, however, the positive factors seem to outweigh the negative factors, and most new communities either have or will have a cable television system. These factors are important in evaluating the leverage of the community in negotiating additional educational services from the cable operator in the franchise agreement.

B. The Committed, the Interesting, the Conventional and the Exception

The nation's experience with cable television in new communities is going to be limited for a long while. The new town movement is so young that only a few of the new towns actually have people living in them. To expect a great deal of tangible evidence as to the usefulness, the practicality or even the potential impact of cable television in new communities is not particularly reasonable at this point in time. Most of the HUD Title VII new towns are still at the "feasibility study" and "agree to explore" stage of their development concerning the installation and use of cable television.

Among the new towns described in this section (a by no means exhaustive list), only three actually have cable television systems in operation today -- Cedar-Riverside, Saint Charles and Reston. While the history of cable in these communities is too brief for any serious assessment, if one were to venture one albeit premature judgment, it would be that CTV systems are being used by the new communities in a very limited way.

1. The Committed: Those New Towns with Operating Cable Systems

Reston, Virginia

The cable television system in Reston typifies the limited use communities and schools make of their cable television systems.

The current population of Reston stands at about 21,000 and is growing rapidly. A dual coaxial trunk cable has been built into the development as new neighborhoods have been added. This cable passes all of the homes in Reston. All housing units in Reston are prewired. Apartment units are automatically hooked up to the cable and the $5 monthly subscription fee is included in the rent. Detached dwellings have the option of connecting the drop for a monthly subscription fee of $6. The system has one local origination studio which programs approximately twenty hours of local production per week. Most of this is original material.

The system is owned and operated by Warner Cable of Reston. Currently, 4,450 households receive the CTV service, a figure which represents approximately 62 percent penetration. The CTV manager claims that this subscription figure is below the level necessary for him to "break even." This is due to the high front-end costs involved in expanding the system to include more Reston residence units. However, the new community is growing quickly and eventually plans to have approximately 30,000 dwelling units. At that point the Warner Cable of Reston would have far surpassed their "break even" point.

All of the county schools located in Reston have a two-way drop to the cable (paid for by the cable company) and have free use of the dedicated education channel.

The school buildings themselves have been internally wired at the expense of the county. The schools, however, do not use the cable extensively and have limited (if any) equipment for the origination of their own programs. (The CTV manager attributes this to "school budgeting problems.")

With a comparatively low subscription level, the manager has a very limited programming budget and, therefore, depends heavily on volunteer assistance. One notably successful program involved a volunteer from Reston who ran a weekly "nature hour" (with a gallery of forty children) for almost two years. The manager has also trained many high school students who now help operate the studio and who video tape local events. Most programs appeal primarily to the adult population, and local colleges and universities have conducted video courses that have been successful. The manager mentioned that his programming suffers from the inconsistency of his volunteers. The woman who ran the nature hour had to give it up for a full-time job, and the college courses are sporadic because professors are not always willing to drive all the way from Washington, D.C., to Reston.

For further information about cable television in Reston contact:

Thomas Bartelt
Television Production Manager
Warner Cable of Reston
Reston, Virginia 27091
(703) 471-1749

Cedar-Riverside, Minnesota (Minneapolis)

This in-town new town has connected 1,300 dwelling units to a dual coaxial cable built into the development. One of the cables has been left inactive while the other is used only to provide antenna service. The only head end equipment is an antenna. The system is controlled by Cedar Riverside Associates (the developer) and may eventually be linked to nearby universities and hospitals. The franchise agreement requires the cable owner to study the possible uses of the cable television system in monitoring hospital patients and disseminating information on preventative medicine. However, there are still no definite plans for this.

For further information about cable television in Cedar-Riverside contact:

Larry Anderson
Planner
Cedar Riverside Associates
1929 South Fifth Street
Minneapolis, Minnesota 55404
(612) 338-8801

Saint Charles, Maryland

The infrastructure of sewers, streets and lighting has been completed for the first neighborhoods, and roughly 100 residential units have been built since September, 1973. The pace of residential construction is slated to increase rapidly over the next two years, and the developer projects an eventual population of 80,000. The cable operation is run by St. Charles CATV, Inc., a subsidiary of the development corporation. A dual coaxial cable has been laid, and schools and community buildings will be connected to it at no expense to the county. All homes will be prewired. Although the franchise agreement stipulates that the corporation will explore the possibility of developing the cable system to include business, education and recreation, at present there are no specific plans to carry this out.

For further information about cable television in St. Charles contact:

Jay Parker
Representative for Harmen,
  O'Donnell and Henninger
336 Post Office Road
St. Charles, Maryland 20601
(301) 843-8600

2. The Interesting: Those New Communities Developing Plans and Cable Systems Designed to Integrate School and Community Activities

Roosevelt Island, New York (New York City)

The in-town new town of Roosevelt Island is rapidly becoming a reality. Construction is well underway and the first residents are expected to move in during September, 1974.

The Roosevelt Island Development Corporation is planning to provide a cable television network with capacity for two-way communication. The system would include an alarm network to detect illegal entry and uncontrolled fire. Plans are being made to use the system for community meetings; to communicate between educational spaces; and to provide handicapped and homebound people with links between their apartments.

An important consideration in the design of the cable system is the unique structure of the educational space planned for the Island. The educational and residential facilities were based on the idea of joint occupancy. Educational spaces are dispersed among as many as fifteen different locations, including the hospitals, the library, the police/fire station, the theatres, the stores and the cultural resources. The main educational facilities for middle and high school students in particular will be organized in seven major centers. Each center specializes in a central concept such as the arts, communications, economics and work, science and technology, etc.

Coaxial cables are buried under the streets and connected to building parcels by drops built into each structure. The cables will connect all of the educational spaces. Apartment residents will be able to link up to the network by subscribing to the cable television system. The nerve center of the cable network will be an "Educational Exchange/Communication Center" which will be located in the Town Center. Ideally, through the Exchange, a computerized information and learning system, the Island school system, the community and residents who choose to do so will be able to tie into the cable television network.

Plans defining the number, location and sophistication of local origination studios have not yet been finalized. One of the high school centers, however, will accommodate a Visual and Performing Arts program and is likely to be equipped with a studio.

The Roosevelt Island Development Corporation (RIDC) decided to install conduits rather than the coaxial cable itself. After a franchise agreement has been written, a CTV company will pull its cables through the conduits and create the cable network. The conduits are actually a "bank" of twelve ducts (each duct is four inches in diameter) which are buried under the streets of the development. Four-inch steel pipe service ducts lead into the building parcels. (There was some controversy over the size of the ducts. It seems to have been resolved in favor of the larger four-inch duct on the basis that "overproviding is far less costly than underproviding.")

Negotiations are presently underway between RIDC and Sterling of Manhattan, the probable CTV franchise operator. One of the major issues under negotiation is "universal CTV wire-up." RIDC wishes to provide its residents with a master antenna system laid within the original ductwork. RIDC has proposed a monthly contract rate of $3.50 per apartment or $17,500 for all 5,000 units. This monthly gross would correspond to an effective 58 percent penetration rate which is much higher than Sterling's current market success. If Sterling agrees to this, the cable system will eventually connect every home and every school space in the community. Such a universal system could have tremendous implications for education.

The proposed cable system may eventually tie Roosevelt Island residents to the many resources of Manhattan. For example, a two-way video link could be developed between a health clinic on Roosevelt Island and a hospital in Manhattan. Mt. Sinai Hospital in Manhattan is currently operating a two-way video telemedical consultation service with the Wagner Pediatric Clinic in East Harlem. Telecommunication ties could also be developed to deliver cultural resources to the Island. The New York State Education Department has proposed a $338,500 demonstration of on-demand cultural resources video programming between the Metropolitan Museum of Art and School Board District No. 2 (Roosevelt Island is located within District No. 2). Ten wired origination galleries at the Met would connect to ten classrooms in separate schools with video reception and audio feedback.

For further information about cable television on Roosevelt Island contact:

Robert Litke
President
Roosevelt Island Development Corporation
1345 Avenue of the Americas
New York, New York 10019
(212) 974-7017

Jonathan, Minnesota

The new community lies within the limits of Chaska, Minnesota, a small city (population 4,000) located twenty miles southwest of Minneapolis-St. Paul. The cable operator, Community Information Services (CIS), is constructing a two-way cable system to serve Chaska (aerial cable) and the new town (underground).

Jonathan represents the most ambitious attempt on the part of the cable operator to educate and involve the community in the use of CTV. The Jonathan CIS program is unique because of the stress it places on community involvement in the development of the project. Two advisory committees are being formed. One group will include representatives from a broad cross section of the community to determine community-wide applications of the Community Information System. The other group will be composed primarily of parents, teachers and school administrators who will concentrate on integrating the Community Information System and education.

The four schools in Chaska (two elementary, one junior high and one high school) as well as the Jonathan Community Center, medical clinics and a community greenhouse are all connected to the cable. Each of these schools has the video equipment necessary to transmit live programs from any classroom to any other classroom in the four-school district. The same holds true for the community center. This equipment has been used, for example, to run a career education program in which students in the different schools carried on conversations with people from a variety of occupations who had been invited to the community center.

CIS would like to expand its operations by extending the cable into the neighboring school district of Waconia. This would enable the two school districts to share the expense of specialty teachers (e.g., in languages) by means of classes conducted over the cable.

In addition, the CIS system also offers a television information retrieval service for the schools. Students and teachers can dial the CIS headquarters (from terminals in the schools) for video tapes to be played back to them on a variety of subjects.

Two medical clinics in Jonathan have also been connected to a hospital outside the project boundaries. Mobile units are located in these clinics for transmitting and receiving information.

CIS is planning to develop a microwave connection between Jonathan and Minneapolis and between Jonathan and Cedar-Riverside. Such a link might lead to economies of scale in the construction and operation of central facilities.

CIS views it role primarily as one of researching and demonstrating the possibilities of two-way cable television systems. It operates a demonstration center in the Jonathan Community Center in which various types of available home terminals are on display. Included are terminals for transmitting information "upstream" and for retrieving information. Part of the work of CIS was done under contract with HUD. One of the provisions of the contract was that CIS sponsor a consumer demand study based on the demonstration facility.

It is still too early to judge the success of CIS in involving the community. There are only 700 dwelling units occupied in Jonathan and the units will not be connected to the cable system before December, 1974. If construction is not completed before December, the operation will have to wait for a spring thaw sometime the following May. From telephone conversations with CIS people, however, one problem is already clear -- funds for experimentation with programming are insufficient and dwindling.

For further information about cable television in Jonathan contact:

Edward McCormick
Community Information Services
Jonathan Village Center
Chaska, Minnesota 55318
(612) 448-4800

West Valley

At this point West Valley is nothing more than farmland in a rural area twenty miles west of Chicago, Illinois. If construction holds to schedule, however, ground will be broken this August for a new sewage treatment plant designed to serve the future community. Residential construction will begin in June, 1975. A cable system is being planned that will interconnect all schools, libraries, government centers, health facilities, industries, businesses and possibly homes to television and computer sources. The Illinois Bell Telephone Company, the University of Illinois and the Chicago Circle Campus have offered to assist in planning a comprehensive communications system. It is hoped that cable television will be used to help merge the schools into the total life of the community so that the community's businesses, industries and governmental agencies become an extension of the educational process. The development will include a two-way cable system connected to public schools and to Northern Illinois University. Initially, the cable system will be owned by the developer and several other investors. The developer feels that this is the only way to guarantee the delivery of cable service to the new community.

For further information about cable television in West Valley contact:

Louis J. Garapolo
Perkins and Will
309 West Jackson Boulevard
Chicago, Illinois 60606
(312) 427-9300

The Woodlands

The use of cable technology in The Woodlands, located twenty-eight miles north of Houston, Texas, is likely to turn into a very exciting educational experience for students, teachers and the community. The developer, Mitchell Development Corporation of the Southwest, plans to make cable service available to all of the public and private facilities and structures of the new town. It is quite likely that the cable origination studio will be constructed as part of one or more of the school/ community centers. At this point the planning is all very tentative and a franchise operator has not yet been selected. However, the cable is being laid along with utility lines as buildings are being constructed. Careful consideration is being given by the developer and the Conroe Independent School District to ways that cable programming and production can become a normal curricular option for students.

For further information about cable television in The Woodlands contact:

Charles Kelley
Mitchell Development Corporation
of the Southwest
2201 Timberloch
The Woodlands, Texas 77301
(713) 353-8511

Gananda

Gananda is a new community located twelve miles east of Rochester, New York, and planned for an eventual population of 85,000. The developer hopes to have sixty-five units occupied by the end of 1974. The infrastructure (streets, sewers, lighting, etc.) for the first phase of development is complete. The first community center is now in design stages and will include a local origination studio and space for junior and senior high school students. The developer is building a two-way cable system which will lead into all of Gananda's schools. It is still uncertain which cable company will be given the franchise to operate the Gananda cable system. Therefore, the specific provisions of the franchise, particularly the provisions pertaining to public and educational access channels, have not yet been worked out.

For further information about cable television in Gananda contact:

George Thomas
New Wayne Communities, Inc.
109 South Union Street
Rochester, New York 14614
(716) 232-4854

3. The Conventional: Those New Communities in the Early Planning or Construction Stages that Have Decided to Include a Cable System in their Development Plans but Are Not as Yet Considering Special Uses

Audubon: (25,000 eventual population; located ten miles northeast of Buffalo, New York.) The new town of Audubon falls within the franchise jurisdiction of the Amherst Cable Vision Company. Two-way cable has been installed along with the utilities for the first forty-four units of Audubon's housing. As yet, however, there is no agreement to build schools. Consequently, no provision has been made to connect schools to the cable. Audubon is very near Amherst, New York, which currently has between 3,000 and 4,000 subscribers.

For further information about cable television in Audubon contact:

Ali Amahandani
Audubon New Community
2222 Millersport Highway
Getzville, New York 14068
(716) 688-6121

Flower Mound: (65,000 eventual population; located twenty miles northwest of Dallas, Texas.) The developer, Flower Mound New Town, Ltd., has recently completed the infrastructure for the first phase of development. United States Homes, a construction firm, will be building fifty units of housing during the next six months. A two-way trunk cable has been laid and all homes will be prewired. The developer has made an agreement with TOCOM, a CATV company from Fort Worth, to operate the facility. The developer is a major stockholder in TOCOM.

For further information about cable television in Flower Mound contact:

Dr. Gary James
Flower Mound New Town, Ltd.
P.O. Box 31705
Dallas, Texas 75231
(214) 369-1234

Maumelle: (50,000 eventual population; located twelve miles northwest of Little Rock, Arkansas.) The sewers and streets for Villages I and II are being completed. The construction of residential units is scheduled to begin April, 1974. The developer is working with a cable company to install a two-way cable system in the community and to connect future schools to the system. The trunk line, however, has not yet been laid.

For further information about cable television in Maumelle contact:

Mr. Dowell Naylor
Executive Vice President, Development
Maumelle Land Development Company
Route 2, Box 343-E
North Little Rock, Arkansas 72118
(501) 851-1258

Midland: (50,000 eventual population; located between Lexington and Huntington, Kentucky.) Midland is still in the early planning stages, and ground-breaking will not take place until 1977. Nevertheless, the developer is already making plans to provide Midland with a two-way cable system which will hook up by microwave to the state-wide KETV (Kentucky Educational Television) which headquarters in Lexington.

For further information about cable television in Midland contact:

Dr. David Spaeth
Manager for Development Planning
Gateway Area Development District, Inc.
P.O. Box 107
Owingsville, Kentucky 40360
(606) 674-6355

Oak Openings: (50,000 eventual population; located outside Toledo, Ohio, in Lucas County.) This project is being developed by the City of Toledo in conjunction with Lucas County, site of the planned new community. It began as a renewal project in a rural area outside of Toledo and has grown into a proposal for a new town. Since the project is still in the very early developmental stages, little planning has been done as far as a cable television system is concerned. Present planning, however, does call for the installation of underground utility lines. Therefore, cable could be installed at minimal cost.

For further information about cable television in Oak Openings contact:

Herbert Hoehing
Oak Openings Community Development
1010 Spitzer Building
Toledo, Ohio 43604
(419) 242-7409

Radisson: (Formerly Lysander, 20,000 eventual population; located twelve miles northwest of Syracuse, New York.) Presently, the construction in Radisson, another new town being developed by the New York State Urban Development Corporation, is limited to the installation of roads and sewers and the development of an industrial park. The building schedule calls for the completion and occupancy of 100 residential units by January 1, 1975. Sleeves (conduits) are being buried under the streets for the eventual installation of coaxial cables. The design of the future cable system and the negotiation of a franchise have been postponed pending the outcome of a study recently undertaken by the New York State Cable TV Commission.

For further information about cable television in Radisson contact:

James Barwick
Radisson New Town
8255 Willett Parkway
Baldwinsville, New York 13027
(315) 638-0271

San Antonio Ranch: (88,000 eventual population; located twenty miles northwest of San Antonio, Texas.) Spokesmen for the developer, San Antonio Ranch, Ltd., feel that two more years are needed before the infrastructure will be completed and residential construction can begin. Along with the utility lines, the developer expects to bury sufficient cable to provide for a two-way

CATV system. The relationship of schools to the CATV system will depend upon the provisions of the eventual franchise agreement.

For further information about cable television in San Antonio Ranch contact:

Larry Wilkinson
San Antonio Ranch, Ltd.
720 Travis Park West
San Antonio, Texas 78205
(512) 224-9558

Shenandoah: (70,000 eventual population; located thirty-five miles southwest of Atlanta, Georgia.) This development is also in the early planning stages (although it has received a HUD loan guarantee). The developer will build a two-way cable system into the community. The CATV company that will eventually receive the franchise to operate the system will be expected to provide for local origination.

For further information about cable television in Shenandoah contact:

Marion Glustrom
Social Planning Consultant
Scott Hudgens Co.
Suite 300 Scott Hudgens Building
P.O. Box 20767
Atlanta, Georgia 30320
(404) 768-3411

Soul City: (44,000 eventual population; located forty-five miles north of Raleigh-Durham, North Carolina.) Soul City is located in a rural and economically depressed area of North Carolina. The developer is attempting to create a new growth center (especially for blacks) by attracting industry to the new town. Jobs are the highest priority and there is little talk of cable.

For further information about cable television in Soul City contact:

Eva Clayton
Director of Social Planning
Soul City Foundation, Inc.
P.O. Box 38
Soul City, North Carolina 27553
(919) 456-3111

Timberlake: (31,500 eventual population; located twenty-five miles southwest of Knoxville, Tennessee.) The Timberlake Community Development Corporation, a combination of Boeing Aircraft and the Tennessee Valley Authority, plans to break ground for residential construction in 1976. Development has been delayed by a long legal battle between environmentalists and a dam TVA planned to construct at the Timberlake site. The battle was won by the Timberlake interests, the dam is almost completed and plans have gone ahead to begin the construction of the infrastructure. The developer plans to provide a two-way cable system connected to schools and linked to studio facilities at the University of Tennessee.

For further information about cable television in Timberlake contact:

William O. Oakes
Timberlake Community Development Corporation
Alcoa Building
Faraday Street
Alcoa, Tennessee 37701
(615) 984-5010

4. The Exception

Columbia, Maryland

The history of Columbia's experience with CTV is interesting because it represents a situation in which the cable company and the community (in this case it was Howard County) could not reach an agreement. The result is that no cable system was ever built.

Approximately five years ago, Time-Life Cable, Inc., approached Howard County with a proposal for a large-scale model cable television system for Columbia. The system planned represented the ultimate at that time in cable television: dual cable with three, color origination studios.

Unfortunately, the County (anxious about losing control of a local public utility) escalated the demands of the franchise to such an extent that finally Time-Life called off the negotiations and left.

During the five years that have elapsed since the negotiations with Time-Life, Columbia has grown into a development of 10,000 dwelling units. The sewers, streets and sidewalks are already in, and the utility lines have been buried without including a coaxial cable. Recently, interest has emerged for a cable television system for Columbia and Howard County. Since overhead utility lines are not permitted in Columbia, when and if a cable is installed it will have to be put in underground at an extremely high expense. Given the high cost of installation, most Columbia residents doubt that any cable television system installed today could ever provide what the previous system had proposed.

For further information about cable television in Columbia contact:

John Levering
9879 Old North Road
Columbia, Maryland 21044
(301) 730-5773

There are many other new communities in the early planning or early construction stages that have decided to include a cable system in their development plans. Rather than being welcomed as a tremendous resource for communications and education, the systems have been accepted simply as another accouterment of the community's physical plant. Even in Jonathan where the cable operator, CIS, views its task as one of demonstrating the system and its potential to the community, cable has not been able to generate the interest and support capital needed to expand the programming sufficiently.

In an overwhelming number of new communities, the basic hardware for a two-way cable system is already in place, under construction or included in the basic planning. This hardware includes more than a simple network of cables. It also includes studios, studio equipment and sometimes very sophisticated response terminals. Much of this equipment can be used by schools and by the greater community depending upon the provisions of the franchise agreement. The problem, therefore, does not appear exclusively to be the development and delivery of hardware, but rather the development and delivery of software.

C. The Educational Situation - Applications for Technology

In its best light, there is little question that educational technology can do all of the things its supporters claim are possible, and the technology supporters make some rather extraordinary claims.

The Kennedy Space Center in Cape Canaveral, Florida, has just lauched a $180-million educational satellite that will be used for a year to beam televised health and training programs to rural areas of Appalachia, the Rocky Mountain states and Alaska. During the second year of the satellite's life it will transmit educational, medical and agricultural programs to India. P.V. Krishnamurphy, deputy director general of India TV, claims that illiteracy in India could be eliminated by 1981 through the use of satellites. This is a rather extravagant prediction since 70 percent of India's population is illiterate. However, the Indian government is planning to install television sets in schoolhouses and town halls in 5,000 communities in seven states. In 1977, it hopes to launch an educational satellite of its own.

In its considerably less ambitious forms, educational technology has demonstrated very practical and realistic applications. *Cable communication*, for example, enables home-bound students to participate actively in classroom programs; it can make special teachers, events and activities available to many classes; it can provide preschool and continuing education programs for home viewing; it can connect classrooms and computers to libraries and community resources. *Computer-aided instruction* can improve a student's ability to read and to calculate; it can provide simulation exercises, diagnostic tests and vast quantities of information.

There are more than enough examples to provide us with concrete evidence of technology's very real potential for contributing to education. However, a clear distinction must be made between technological capability and the practical realization of that capability. There are also very bracing examples of the less than successful uses of technology. Educators in new and renewing communities must consider carefully the ways that communications technology can be used most productively by students and by teachers.

The introduction of communications technology -- cables, microwave, dial access, cassettes, tape recorders, radios, computers, ad infinitum -- is neither an alternative for creative teaching nor a solution for uncreative teaching. It is simply a tool, one which can be used to aid in a person's development. The variations are infinite and depend upon the ability of the technology to adapt to the needs of the people who use it. The success of technology as an educational tool also depends upon the quality of the programming and the ability of educators to use technology creatively. If the technology is applied in a rigid, unimaginative or unresponsive fashion, the educational results are going to be predictably disastrous.

Additionally, communications technology requires a considerable financial investment which must be balanced against other ways that money might be spent. As yet, there is no definitive evidence to tell us whether or not communications technology in the long run will produce better educational results for the same amount of money now being spent on education. The most advanced forms of educational technology, cable television and computer-aided instruction, are still very much in the developmental stages as far as software is concerned, and, although the hardware is available, it is expensive.

The burden of proof for introducing cable and computers on a large scale for educational purposes seems to belong to cable and computer companies and to adventurous school systems that can afford to demonstrate that promises can be kept. Those promises, however, will not be kept if cables and computers are viewed only as pipelines to carry teaching and demonstration lessons. If cables and computers are to have a profound effect, as profound perhaps as the invention of the book, then the medium must indeed be the message.

Socrates, when speaking to the inventor of the alphabet in Plato's Phaedrus, worried that "this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories, they will trust to the external written characters and not remember of themselves... They will appear to be omniscient and will generally know nothing." The computer, with its incredible ability to store enormous and easily accessible amounts of information, once again reduces the amount of information that one has to commit to memory. If the promise of computers and cables is to be realized, the function and role of the teacher must change from one of dispensing knowledge to one which emphasizes how the knowledge that is available can be applied.

Thus far technology has been used primarily for the purpose of instruction -- learning from the outside in -- and students have most often been the somewhat passive recipients of ideas, information and attitudes determined by a relatively small number of people. However, with the development of inexpensive, portable videotape equipment and public and educational access channels on cable television systems, students have a chance to learn technology inside out and begin to participate actively in the way technology is used. Additionally, two-way interactive television permits a much more responsive use of the too often sterile television lecture.

In numerous school systems throughout the country, communications technology is being used and developed in a variety of ways. Many of the experiments indicate tantalizing ways in which the available technology may enable us to bridge the separation that too often exists between the educational system and the other parts of a community, a separation which contributes very little to a student's ability to understand and use his environment. Other experiments using technology are directed primarily toward providing students with information and skill development. Both uses of technology have value depending, of course, upon the quality of the programming and the balance struck between the various kinds of learning activities.

1. Learning from the Outside In: Computer-Aided Instruction, Dial Access, Instructional Television

a. Computer-Aided Instruction (CAI)

The development and use of CAI has met with its greatest use and success in one relatively tiny piece of the curriculum. Students use a computer terminal to practice and master the basic skills of addition, subtraction, multiplication and division. The computer informs a student immediately whether he is right or wrong and provides the mechanical drill necessary to master computational skills. A teacher is freed from correcting endless workbook pages and practice sheets and can spend time in better ways. Computers are also used to provide simulation exercises which present real-life situations that enable a student to see the consequences of his or of other people's actions. Computer-managed education -- the tutorial mode -- is very much in the developmental stages. Theoretically, a teacher can use a computer to handle direct instruction. The sequence of the curriculum would be determined by the computer on the basis of a student's ability and rate of learning.

(1) Montgomery County, Maryland educators are lobbying the County Council to approve an expanded computer-aided instruction program. The current experimental program has been tested for six years in three schools: Pleasant View Elementary School, Newport Junior High School and Einstein High School. If the program is expanded, computers will be installed in twenty of the system's 200 schools. Thus far the CAI programs have emphasized arithmetic and mathematics. Programs are now being developed for reading and language.

The six years of testing have demonstrated that students at all levels perform better on national tests when computers back up classroom teaching. While using computers, students from Rock Terrace School, the county's school for the mentally handicapped, improved so much in arithmetic that educators at first assumed there were errors in scoring the tests.

Catherine Morgan, director of the CAI program in Montgomery County, suggests that a primary reason for the success of the Montgomery County CAI experience is due to the close involvement of classroom teachers in its development. Furthermore, extensive planning is done to carefully integrate the computer into the curriculum, and teachers planning to use the CAI system participate in special training programs. Ms. Morgan also suggests that computer-aided and computer-managed instruction is likely to reduce the future costs of instruction. By using computer-aided instruction some pilot school class sizes were able to be increased by as much as 40 percent. Additionally, while the cost of personnel is rising, the cost of computer hardware is going down.

For further information:

Catherine Morgan
Director, Computer-Aided
  Instruction Program
Einstein High School
11135 Newport Mill Road
Kensington, Maryland 20795
(301) 949-8700

(2) *The Minnesota Educational Computer Consortium (MECC)* represents a *state-wide* effort to provide all levels of education with the benefits of a computer system. By September, 1974, a time-sharing network will be established that will enable all school systems in the state to have direct access to computers by means of terminals located in individual school buildings. Through the Total Informational Educational Services (TIES) program, Minnesota has experimented with computers and education for a number of years. TIES provides computer services to elementary and secondary students in approximately thirty school districts in the metropolitan Minneapolis area. As with the Montgomery County, Maryland, program, the major interaction between computers and instruction has been with mathematics.

For further information:

Ross Taylor
Mathematics Consultant
Minneapolis Board of Education
807 Northeast Broadway
Minneapolis, Minnesota 55413
(612) 348-3000

b. The Dial Access System

The West Hartford School System in Connecticut has an audio-video dial access system interconnecting 160 receiving locations in nine buildings. The major installation is at Hall High School where twenty video and 120 audio programs are available in color and black and white to students and faculty in 115 different locations throughout the school. Programs are dialed from special individual viewing carrels and group monitors.

Seventy-five percent of the teachers and ninety percent of the students say they use the dial access system on a daily basis. The cable system which carries the audio and video programs is owned and operated by the West Hartford School System.

Problem: there is no hard evidence to indicate that the dial access system will ever save anyone any money. It is very much an add-on program, well-used and popular, but one which costs $70,000 a year to maintain. However, the cost must be weighed against the very clear benefits. Its current operational costs are approximately $15 per student, a cost which compares reasonably with high school textbook programs. Approximately 1,000 hours of programming are available for enrichment, inservice and instructional purposes. In addition, the system is used for disseminating to schools "video news magazines" and Student Council election campaigns, and it serves as a base for the "TV Company," a group of gifted and talented secondary school students who write, direct, produce, choreograph, etc., their own television productions for viewing by means of the system. The system also has been used for independent study, class instruction and community viewing of school activities.

Currently, negotiations are underway to expand the system into other community, governmental, social and health agencies. The advent of CATV offers the potential for adding a second 20-channel video cable to the current system providing the West Hartford schools with 40 video channels. The integration of CATV with the dial access system also makes possible the home viewing of all programs done for the school-operated dial access system.

For further information about the West Hartford dial access system contact:

Ira Singer
Assistant Superintendent
West Hartford Public Schools
P.O. Box 47
West Hartford, Connecticut 06107
(203) 233-8281

c. Instructional Television

Instructional television was greeted in the late 1950s and early 1960s as a marvelous way to minimize teacher shortages; to increase class sizes; to allocate educational resources more equitably and effectively; and to improve the quality of the education available to students. Unfortunately, instructional television enthusiasts predicted too much for a communications medium that was too raw to do more than experiment with possibilities. In addition to the internal problems of a developing technology, instructional television has been blessed too often with the obligation of trying to reduce the cost of education. If that is to happen, it will depend upon time and whether or not the present role of the teacher is able to be restructured.

The instructional television programs produced during the past two decades have run the veritable gamut in quality. Those of us who were among the first students to be inflicted with instructional television know how boring the whole thing can be. Similarly, those of us who created our own closed-circuit programs know what great fun television might be. Initially, instructional television meant those programs that were prepared exclusively for use in school, rather than "educational broadcasts" sponsored by public television for a wider audience.

Interpreted more broadly, instructional television refers to the cognitive learning experiences presented in a program like "Sesame Street." The desired outcome of such a program may be as simple as wanting a viewer to know more information, or as complicated as wanting to encourage changes in a viewer's way of thinking -- to have a viewer become more imaginative and to think more creatively or critically or analytically. Programs like "Jabberwocky" may offer cognitive learning experiences, but they are concerned primarily with affective learning or the way people feel about things. Such a program emphasizes emotional reactions and asks a viewer to think about attitudes and motives.

(1) Large-Scale Production: Instructional television is expensive. One of the major reasons why programs like "Zoom," "The Electric Company," "Mister Rogers," "Sesame Street," "Hot Dog" and "Wild Kingdom" have been popular is because they are technically very professional. The teachers are performers backed by musicians,

artists, special effects and a room full of scriptwriters and production assistants. This is all very expensive and programs like "Sesame Street" and "Zoom" continue by the grace of special private and public funding. However, the special funding is not at all dependable. "Zoom" sponsored a nationwide "Zoom Alert" when it was threatened by federal cutbacks.

The Children's Television Workshop (originator of "Sesame Street" and "The Electric Company") is consciously attempting to create a series of programs which combined will form something like a television textbook. Presently, the Children's Television Workshop is planning to produce twenty-six one-hour television programs on physical and mental health. The series is planned primarily for teenage and adult audiences and should be ready for broadcasting in the fall of this year (1974). Such programs -- if not bound to inflexible television schedules -- can be an extraordinarily useful teaching device for teachers to use. Whether the programs show how hot dogs are made or how "ough" operates in a word, they can provide a teacher with a creative resource it is financially impossible for him to produce by himself. However, if teachers must design their classes around a 10:30 a.m. TV program, that program is not going to be used consistently enough to have any effect. At one point CBS was deep in the business of developing electronic video recording (EVR). EVR is a system which records motion pictures and television shows on photographic film. The film is packaged in a circular cassette which could perform a function similar to that of a book. If a teacher or a student -- indeed, anyone -- wished to view a specific program, he could check it out of a cassette library and show it on an EVR player. In 1971, however, CBS closed its New Jersey EVR production center after deciding to concentrate on programming and software rather than hardware.

Presently, SONY is marketing a magnetic tape player, and video phonograph disks are being developed which offer the same easy access and convenience of an EVR system.

(2) The Hagerstown, Maryland, instructional television experiment holds little of the positive energy it

started with when it launched the cable transmission of instruction to schools in 1956. The TV system operates on six channels which are carried on telephone company cables to the forty-six schools in the district. The experiment is eighteen years old and as stable and colorless as the eighteen-year-old black and white studio equipment still being used. Apparently, a crucial problem is that the television is devoted exclusively to large group instruction. There is little if any cooperative planning done between the television teachers and the classroom or laboratory teachers. Teachers and students are ruled by study guides prepared entirely by the studio teachers, and the television schedule reigns supreme. Lectures are not taped and there is no playback equipment for students or teachers to use in classrooms or libraries even if the lessons were taped. Perhaps most disturbing of all, students are not permitted to use the television facilities to produce programs of their own. The per pupil costs are $40 to $50 below the state average, but one wonders if the school system can afford the savings.

For further information:

Vincent Tantillo
Hagerstown Board of Education
Box 730
Hagerstown, Maryland 21740
(301) 731-2700

2. Learning from the Inside Out

If part of the purpose of education is to help people learn how to think, to observe and assimilate, to form judgments and to ask questions, then educational technology must provide ways for students to be active participants in their own learning process. If technology doesn't belong to students and doesn't present them with a way to communicate ideas and respond to those of someone else, its role in education is likely to remain limited.

Working Paper No. IV, "Dollars and Educational Sense," discusses in some detail alternative ways of providing educational space, ways which may not only prove to be less expensive than building conventional schools, but which may offer very special educational benefits as well. While cable television and computers can perform a useful function in ordinary school settings, such technologies combined with community education systems may turn the rather dull business of going to school into something filled with activity and creativity.

School/community centers like those being planned in Gananda, New York, and The Woodlands, Texas, are attempts to dissolve the isolation which separates schools from the larger community. The school can be combined physically and programmatically with a variety of community facilities and activities: health and library services, business and social services, recreation and shopping facilities. Similarly, a dispersed community education system spreads the school system out into the community and reduces the barriers that divide the schools from the community. The community becomes the site and provides the subject matter for a curriculum which emphasizes a student's need to learn how to use and to function within his environment. If technology -- particularly cable television -- is used to support an educational process that attempts to connect the activities of school with those of a "real-life" community, then technology can provide students with a very special learning experience. If students begin to use technology to express themselves and to share their ideas and viewpoints, then they will be active participants in a medium of communication and a visual art form rather than relatively passive and spoiled observers accustomed to switching channels if something isn't immediately pleasing.

a. Inside-Out Computers

Increasingly, computer-based materials are being designed to include games, simulations and plotting activities which allow students to use their own ideas in computer exercises. Among the dozens of simulation exercises developed are three programs available in Minnesota. *BUFLO* is a resource management program where a student learns to control a buffalo herd's annual harvest of adult males and females. *CIVIL* is a war game about the War Between the States in which students allocate money for food, salaries and war supplies and devise battle strategies -- rather bloodthirsty. A more socially conscious program called *POLUT* demonstrates the effect of pollution on different bodies of water.

(1) The Massachusetts Institute of Technology is a storehouse of simulation games. Among them is one called *GLOOM* used by the Sloan School of Management. The computer acts as a market environment in which students make forecasts and set prices. The computer then lets them know just how bad their losses are or how slim their profits. Another M.I.T. computer game called *TURTLE* is a cybernetic (a fancy word for the processing of information) toy marketed by

the General Turtle Corporation. An operator tells the TURTLE to move by typing LOGO commands into a teletype machine. (LOGO is a computer language developed expressly for the TURTLE.) In trying to make the TURTLE move from one point to another, a student becomes familiar with and learns to use a simple computer language and important mathematical and geometrical principles.

For further information about computer games contact:

Patrick Winston
MIT Artificial Intelligence Laboratory
555 Technology Square
Cambridge, Massachusetts 02139
(617) 253-1000

(2) The most expansive -- and expensive -- foray into computer education is PLATO IV, a computer-based teaching and learning system developed by Dr. D.L. Bitzer and the University of Illinois with heavy financial assistance from the National Science Foundation. PLATO IV is an extraordinarily sophisticated system that does not need to be preprogrammed to respond to a user. Consequently, the computer becomes a tool which can be used for more than drill work and the transfer of information. The programming language, TUTOR,

is based on English grammar and was designed for people who have had no experience with computers. An optional touch panel and audio device makes PLATO very useful for nonreaders.

The PLATO project is in its thirteenth year of development. In the current phase, PLATO IV, the system has 400 on-line terminals at seventy different locations throughout the country. Approximately 1,500 hours of instructional material is available in fifty teaching areas ranging from astronomy to zoology. An additional 1,200-1,500 hours of material is now under development.

The basic cost of a single terminal is $5,300. There is a yearly recurring cost of $2,000 per terminal for staff and maintenance support. Complete yearly service, including recurring and user telephone costs, is about $7,500. When the PLATO system is fully implemented and running 1,000 terminals, the total per hour cost will be from fifty to seventy-five cents.

For further information about PLATO IV contact:

Elisabeth R. Lyman
256 Engineering Research Laboratory
University of Illinois at Urbana
Urbana, Illinois 61801
(217) 333-1000

b. A Show of One's Own

Although programs are available and being developed to provide students with a more active role in the use of computers -- including learning computer languages that let kids tell the computer what to do -- computers and terminals still tie users to a physical place. Cable television, cartridge television systems, low-cost film and video recording devices are movable and thus free students to explore and to use the visual media, cable and two-way communication for self-expression. Simply watching television is not really communication. Communication implies a response. Never producing your own television programs is like being able to listen but never to speak.

Since virtually all new communities either have or are planning to develop cable networks, cable television could provide a variety of useful and creative services. In a dispersed community education system, cable can link the various school spaces to each other as well as to community resources. Similarly, in a school/community center or a dispersed community education system, school space in television studios can become a primary part of the curricula. Since cable networks can comfortably carry thirty channels and since most of those channels go begging for users and programming, it is quite conceivable for students in a new town school system to have at least one channel allotted exclusively for their use in addition to the federally prescribed educational channel.

It is no longer sufficient for students to communicate entirely through the linear medium of print. A tremendous amount of today's information and culture comes to us visually through television, photography and film. Education should begin to help students to develop the skills to use this visual method of communicating ideas, and agreements between school boards and cable franchise operators should emphasize and plan ways to place technology in the hands of students. This is quite likely to work to the mutual advantage of cable operators as well as students. Since many CTV systems have very limited local programming budgets, they are dependent upon volunteer assistance. In Malden, Massachusetts, the manager of the cable studio taught a communications course in the local high school. Students enthusiastic about the use of television began to work for the manager on a volunteer basis. They covered local news and sports events with video tape recorders (Porta-Paks) and the tapes were edited and produced as part of evening news programs. Arrangements were made with the school department for students to receive class credit for their work. In addition to providing video tape material, the Malden students are beginning to monitor studio equipment.

For further information contact:

James Grant
Cablevision Corporation of America
112 Pleasant Street
Malden, Massachusetts 02148
(617) 324-0620

There are numerous examples of places where students are learning to communicate with film, tape and television.

- High school students in Denison, Texas, operate a studio equipped with $80,000-worth of color equipment. The students make up production crews which tape lectures by teachers; produce standard weekly programs ("Know Your Schools," "School Personalities," "Show and Tell"); cover sports events; and write and produce documentaries. Students receive academic credit and gain expertise in handling equipment, working as part of a production unit and learning to develop programming.

- In Dougherty County, Georgia, vocational school students help operate a channel the school leases from the cable system.
- In Atlantic City, New Jersey, senior high school students trained by two local cable companies produce, direct and tape a weekly half-hour program called "What's Going on in Your Schools?"
- In Coeur d'Alene, Idaho, elementary school students plan and produce a weekly television program which is taped and carried by the local cable system.
- Public Service Video (PSV) offers a program model for new communities to examine very closely. PSV was established in 1972 by a grant from the Minnesota State Department of Education, Council on Quality Education. It is a high school social studies class that demonstrates how telecommunications through a public access video network can be used not only to learn social studies and language arts, but to understand human relations through extensive involvement with the community. The project is

offered at New City School in St. Paul, Minnesota, for students and adult members of the community who wish to use video for political and social advocacy or for public information.

Public Service Video supports the idea that students and community people can and should have control over their own information, that the community and the schools can work together and that people in the community are a valuable educational resource. Since the program began, forty students and as many as 100 community people have been involved each trimester (twelve weeks) in learning television production research, videotaping, editing and distribution. Videotape programs have been prepared on such community issues as: "Juvenile Bill of Rights," "Shoplifting is a Crime," "'I Can See You Hearing Me,' An Instructional Tape for the Deaf," "Mi Cultura" and "Where does the Buck Stop?" a study about how decisions are made in the public schools.

For further information contact:

Joyce Klepp
New City School
400 Sibley, Park Square Court
St. Paul, Minnesota 55101
(612) 298-5574

The examples of ways students are using cable television are almost endless and significant only in demonstrating that people of all ages are quite capable of using technology if given an opportunity to do so. Cable operators, new communities planners and school districts should give much more than passing attention to the learning and communication possibilities available through cable. This may well entail financing an organization or people to teach the public how to use public access channels and video equipment. Agencies such as Open Channel and New York University's Alternate Media Center were developed precisely for the purpose of teaching the public how to use video equipment and how to make video tapes. These groups work very closely with schools and hope that the video activity will spread to the larger community which will then make better use of the public access channels.

For further information contact:

Red Burns
Alternate Media Center
New York University
144 Bleeker Street
New York, New York 10012
(212) 266-3990

c. Interactive Television

Two-way interactive cable television may someday turn rather unexpected places into classrooms. The two dozen or so pilot projects scattered around the country are very tentative experiments with what may one day turn into a significant educational benefit. Right now the cost of two-way cable communication is prohibitive for the average school system. However, if two-way cable is able to demonstrate startling advantages and eventual savings in education budgets, increased use may bring the price down. This depends upon breaking the rather uncomfortable set of reasonings which say -- you can't bring the price down until you have increased demand, and you won't have increased demand unless you bring the price down.

(1) One of the first interactive systems was developed by the Vicom Manufacturing Company of Dexter, Michigan, and made available on TeleCable's CATV network in Overland Park, Kansas. During 1971, two shut-in handicapped children in Overland were able to interact aurally and visually with each other and with a teacher who taught from a TeleCable studio.

Both homes and studio had small cameras, amplified telephones and a touch pad terminal. The most beneficial part came from increasing the children's contact with other children. The children helped and learned from each other and were not quite so isolated. Since it was not financially practical for the cable station to continue the experiment, the program perished for lack of funding.

For further information contact:

Richard Fairbanks
TeleCable
8221 West 119th
Overland Park, Kansas 66204
(913) 381-6622

(2) TAGER (The Association for Graduate Education and Research of North Texas) inaugurated a closed-circuit television system in the fall of 1967 which interconnects nine colleges and universities as well as seven large corporations in an area that covers 2,000 square miles. The television network was initiated by a major gift from Cecil Green, a founder of Texas Instruments, Inc., and has developed into a complex 6-channel microwave operation. The network links the academic institutions and

permits them to share professors and course offerings. Corporate employees from the participating industrial firms take TAGER courses in special receiving classrooms located in each plant. TAGER now offers a full, four-year program leading to a Bachelor of Arts degree in the classics as well as a Bachelor of Science degree in computer science. The telecasts originate live from regular classrooms and a two-way communication system permits TAGER students in remote classrooms to ask questions and to participate in class discussions. Approximately 1,600 to 2,000 students enroll in TAGER courses each semester. Instructional costs are carried by the member institutions as part of their regular faculty expenditures. Operating and maintenance costs are covered by contracts negotiated annually between TAGER and each affiliated academic institution and industrial firm.

For further information contact:

R.C. Pearey
Executive Director
The Association for Graduate Education
and Research of North Texas
P.O. Box 30365
Dallas, Texas 75230
(214) 231-7211

(3) The Reston, Virginia, TICCIT experiment has moved west and will combine with a good many other experimental uses of cable in Stockton, California. TICCIT (Time-shared, Interactive, Computer-Controlled, Information Television) began in 1971 sponsored by the National Science Foundation and run by the MITRE Corporation. Its first objective was to achieve a technically feasible system for providing homes with instruction, simulations and information. The system combined an ordinary console television set and a standard 12-button touchtone telephone with a TICCIT computer and a device called a frame-grabber which magically keeps a whole channel from being tied up by one response. The TICCIT system, although it sounds immense, was constructed and demonstrated in one single model apartment. The move to Stockton will see a thousandfold expansion of the initial TICCIT demonstration. A high capacity computer will be located in the Communications Center. One thousand computer units will be made available to volunteers who will be selected by the Educational Testing Service at Princeton. However, only one unit will be installed in

each school. During the course of two and a half years, the units will be moved three times so that approximately 3,000 different families will have a chance to participate in the testing. Stockton residents are already volunteering themselves for the experiment. The Stockton system will wed the technologies of two-way cable and computer-aided instruction and thus bypass the need to use phone lines as was the case in Reston.

The Stockton franchise operator, Continental Cablevision, is thoroughly aware of the importance of community participation in the development of a cable communication system. A graduate student from the New York University Alternate Media Center is already teaching Stockton residents how to use Porta-Pak equipment. The Communication Center is open for public tours, and slide show presentations explain the kinds of services a cable system can provide. The system will begin operating this September with 5,000 subscribers.

Two years ago the Stockton CTV formed a consortium which is developing plans for the educational uses of cable television. The consortium includes the University of the Pacific, Clavell College (exclusively Spanish-speaking), San Joaquin Community College, Stockton Unified School District and Lincoln Unified School District. There have been several outgrowths of this consortium: a Stockton/University of California at Davis proposal for a two-way interactive cable remedial reading program; a University of the Pacific proposal for the establishment of learning centers; and thirty-five hours a week of instruction which is transmitted by microwave to the Stockton CTV studio from U.C. at Davis. By April the microwave transmissions will be converted so that sites remote from the studio will be able to receive the U.C. at Davis programming.

The Stockton cable franchise operator is using the mini-hub concept of designing cable plants. Stockton will be divided into six separate systems which are also connected into one major system. Each section can operate independently of the others. This multiplies the channel potential so that there are essentially 128 channel possibilities. Each sub-hub center is located in a commercially-zoned area and will provide studio facilities for public use.

For further information contact:

Raymond Joslin
Big Valley Cablevision, Inc.
4955 West Lane
P.O. Box 7577
Stockton, California 95207
(209) 466-1567

V.

Who Pays for Cable Technology and How?

V.

Who Pays for Cable Technology and How?

The promises cable technology holds for education in new communities are directly related to the franchise agreement and to the quality and method of providing the cable programming. Those two factors are very much governed by the simple economics of profits and losses for the cable operator and costs and benefits for the school system. Cable is a business. People invest the capital required to start a cable network because they expect to make a profit. However, cable is a local political phenomenon and cable licenses are granted only by whatever issuing authority is determined by a state to be the legal representative of the political jurisdiction in which the cable company wishes to operate, i.e., city manager, mayor, town council, county commissioner, board of selectmen, etc. The issuing authority negotiates the terms of the license with the cable operator, and it is during that negotiation process that educators can influence the terms of the franchise.

A franchise is a set of guidelines agreed upon prior to the installation of the cable system and is likely to include the following provisions:

1. Three channels shall be dedicated to public use: one for education; one for local government; and one for any other public use. These channels shall be provided free of charge to the community by the cable operator.
2. All schools and community centers must be connected to the cable by the cable operator free of charge.
3. The cable operator must provide a local origination studio in the community (or however many can be agreed upon given the size of the system).
4. This studio and its equipment must be made available within reason to the community for purposes of local programming.
5. The subscription rates for the system shall fall within certain limits and, in order to determine fair rates, financial records must be kept on an audited, detailed, uniform basis.
6. The cable operator shall pay three percent of his gross receipts to the municipality in tax in return for the exclusive right to service a certain community.
7. The duration of the franchise shall be ten years, after which the municipality has first option to purchase the system at a price set at depreciated plant value plus an incentive to be paid to the operator according to his success in operating the system.

Although this list is hypothetical, most of the provisions cited are included in franchise agreements as a matter of course. The final draft of the franchise is a compromise agreed upon by the cable company and the community after a considerable amount of negotiation. Each community should prepare a statement which defines its cable needs. Potential cable operators can then respond with specific ways to satisfy those needs.

Cable is in a rather curious position, however. It is subject to local, state and federal regulation. Even when a local franchise agreement is established, the franchise operator must satisfy state procedures and also must receive a certificate of compliance from the Federal Communications Commission (FCC) before the system can begin to operate.

The following areas covered by a 1972 FCC regulation carry particular importance for education in new communities:

1. All new CTV systems (since March 31, 1972) in the top 100 markets must have a minimum channel capacity of twenty channels and the technical capacity for two-way communication built in. (The two-way, non-voice return communication capacity does not, however, have to be operational in the return mode.)
2. There must be at least one nonbroadcast channel for every broadcast channel. Three of the nonbroadcast

channels must be dedicated to public access, education and local government. All of these access channels must be available on a first-come, nondiscriminatory basis, with no censorship allowed beyond obscenity and lottery prohibitions. Beyond program origination by the operator, all other nonbroadcast channels must be available for leasing.

3. The FCC is requiring operators in the top 100 markets to maintain production facilities for the public access channels. No specifics are provided as to the type or amount of equipment necessary and the access, leased and originated programming presently will not have to meet any technical standards.
4. Within a year of the issuance of an FCC certificate of compliance, energized trunk cable must be extended to a substantial percentage of the franchise area. Initial and successive annual rates of wiring are to be determined by the franchising agent.

There are a few interesting limitations to the federal regulations, however, which new communities and school systems should take into consideration when planning a cable system. Every new community may not have an educational access channel. The new town must be in a top-100 market for the federal regulations to apply. Although the FCC requires substantial wiring, care must be taken in the local franchise agreement to establish the areas to be wired. Cable operators will want first to wire those areas where the population will be most dense, most able to afford cable service and nearest to the head end. The location of schools may bear no relation to any of these factors. Furthermore, many of the educational spaces in a new community may not necessarily be in schools. It would be wise for the local issuing authority to insist that all schools (public and private), community centers and libraries be connected to the cable system free of charge. Furthermore, if a dispersed school system is being considered, care should be given to provide cable service to spaces which eventually may assume a significant educational role, i.e., an art gallery, major business, theatre, government center, etc.

The leverage of a new community (municipality) in a franchise negotiation stems from the exclusive market potential it controls and can offer to a cable operator. The following events normally transpire during the course of a franchise negotiation. The community decides it is interested in fostering a cable television system or is petitioned to such an end by a CTV company. In conjunction with an expert, the community assesses the potential of the market it can offer (e.g., number of residents, incomes, etc.) and its own particular needs regarding cable links to schools, local programming and potential cable-related tax revenues.

Prior to issuing requests for proposals from interested cable companies, public hearings usually are held and a community ordinance is developed defining terms favorable to the community's interests. At this time, those concerned with the educational uses of cable television should determine educational guidelines to be included in the general franchise negotiation. Appendix C includes a number of considerations and issues educators should be aware of and should write into a franchise document. The problem of defining the educational uses of cable is complicated by the very broad definition of those local educational authorities which are eligible to use the educational access channel. The Federal Communications Commission's most recent (April, 1974) definition of educational authority includes "any school, college or university, public or private, formal or informal."

Competent technical help should be sought when educators and the larger community begin to develop an adequate CTV ordinance. The Cable Television Information Center (address, telephone number and contact person listed in

Appendix B) is one agency which provides such technical assistance. Until a CTV ordinance and act or regulation are prepared, no action should be taken by the Issuing Authority to solicit cable company bids. The most favorable position for an Issuing Authority is to franchise cable services to a single private corporation that would install, operate, maintain and improve the system. An ordinance and regulations should establish clearly the minimum requirements for a cable system; the competitive bidding procedures to be followed in granting the franchise; and the criteria for evaluating the bids. Once this is accomplished, cable companies are invited publicly to make a bid for the franchise, and negotiations begin with interested companies. (Several years ago there may have been fifty or sixty companies responding to such invitations. Today the number would be more like ten or fifteen. There are many explanations for this. One important factor has been the increased sophistication on the part of communities in drawing up their franchises.) Finally, a single cable television company is awarded the franchise and work begins. Often the systems are in operation within a year or a year and a half after the franchise settlement. Caution: the franchise agreement should be determined with the utmost care. After the settlement is submitted to the FCC for approval and a certificate of compliance, even minor changes will cause the application to be moved to the bottom of a very long waiting list. Occasionally, a cable operator will offer an attractive addition to a settlement after an application has been submitted to the FCC. Often this is done intentionally to delay the application process for a year or more. This means the cable operator extends his time limit for the installation of a cable system since work cannot begin without an FCC certificate of compliance.

The leverage of the cable operator in the franchise process resides in his freedom to select communities that appear economically attractive for his business. His costs are high no matter where he plans to operate. For example, the investment capital needed to develop a typical system to serve a community of roughly 20,000 households [one-way cable (single cable) aerial] with one low-cost color local origination studio is about $1,100,000. This works out to roughly $50 per potential subscriber. The returns, depending on the market, can also be high. Many companies base their financial models on a penetration of 30 to 40 percent of the community (i.e., 30 to 40 percent of the homes passed by the cable must subscribe to its services). The operator's fixed costs (i.e., paying off initial capital investment) are fairly constant regardless of whether he obtains 30 or 70 percent penetration. The cable is there and he has to pay for it. His operating costs are a function of his own decisions with respect to programming. Therefore, if he can collect a monthly subscription fee from 70 percent of the households along the cable rather than from 30 percent, he will stand to make a tidy profit.

The success of a franchise negotiation is based upon mutual self interest. It is to the benefit of the community to use the cable television system as a resource to further its own goals for education, communication, entertainment, etc. This includes access to programming equipment and program time. It is to the benefit of the cable operator to draw the community (especially the schools) into local programming as a way to sell subscriptions. The more people he can get interested in watching themselves, their children and their friends on television, the higher his gross receipts will be.

The key to local programming is a studio and personnel to run it. The manager of a CTV system holds the responsibility for programming. For most CTV companies it would be impossible and economically impractical to offer twelve-hour programming. Most managers concentrate on putting together good programs to fill roughly four to six hours of cable time each evening. The manager is usually assisted in this task by a video technician, additional program producers (if his budget allows it) and numerous volunteer workers. Many CTV systems have low local programming budgets and therefore are dependent on volunteer assistance.

In some communities CTV managers and schools have taken their mutual interests a step further by developing an origination studio within a school that is tied to the cable network. This studio is normally supervised by a member of the school staff who also teaches courses in communications, television and programming. The students are responsible for their own programming and have free access to a dedicated channel.

Almost every new community now under construction or in the planning stages is providing a cable television system at the expense of the developer or the cable company that has been granted the franchise to operate the system. Although this expense will eventually be passed along to subscribers, the initial front-end capital costs of the system need not come from public coffers.

The question of "who pays?" becomes more controversial, however, when the use of the system moves from the conventional concept of commercial CTV into the area of public access, especially when it involves expensive equipment. For example, if a high school class wishes to participate in local programming and their productions will help to sell subscriptions for the franchisee, who pays for the video equipment? Or to make the question more difficult, if a school system pays a media specialist who helps train students to assist the cable manager in programming, should the manager lend his equipment or should the school system buy its own? The answers to these kinds of questions obviously depend on a myriad of factors associated with each unique situation.

If the cable company is operating in a lucrative market, it will be more likely to add equipment that could be used by community and school groups. If the cable operator and faculty from the school system agree on the role of CTV in the community, they may work closely, sharing personnel and equipment.

In many of the new communities discussed, the decision about which cable company will be awarded the franchise has not yet been made. Since the franchise provisions are still unwritten, the school systems have an excellent opportunity to determine and to express their needs. This can include the wiring of schools at the cable company's expense, access to equipment and studio, assistance in programming (e.g., the CTV manager might teach a course for local high school students in programming) and demands that some portion of the municipal tax on the cable company's gross profits be used for the purchase of CTV equipment for schools and for the salaries of personnel to teach programming.

There is no guarantee, of course, that all or any of these demands will be included in the final franchise agreement. The success or failure of each provision will depend upon the interest of the school department and the pressure it can bring to bear at the time of final franchise negotiation.

At some point early in the development of cable, the school system and the cable manager should sit down and begin to design an approach for the school system's use of cable television. This approach may have been defined quite carefully in a franchise agreement or it may consist of a very informal agreement to "study" the educational uses of cable. It may constitute nothing more than the cable manager agreeing to teach a course on communications and programming for high school students at the studio twice a week. It may go beyond that to the school system's purchase of a Porta-Pak or two to be used by students taking the course or the assignment of a faculty member knowledgeable in audio-visual equipment into a supervisory or teaching position at the CTV studio.

Except for the purchase of school television sets, the initial hardware costs for cabling educational facilities are minimal, particularly if school space in new communities is wired for cable at the time of construction. If the initial exposure to and experience with CTV is positive, then the school system has the option of increasing its production capability and deciding whether the costs of a school origination studio, special teaching personnel and inevitable operating expenses are worthwhile or sensible.

VI.

Where Do We Go from Here?

VI.

Where Do We Go from Here?

In any context, but perhaps especially in the new town context, the telecommunications "revolution" we are experiencing raises a host of increasingly crucial social, economic, moral and educational problems.

To start with the base economic questions, the continued development and expansion of communications technology will require the investment of a great deal of money, a considerable portion of the future gross national product. The $1.3 trillion figure to cable the United States is, of course, somewhat misleading. As with all new technology, telecommunications will grow only as fast as the general market will allow, only as fast as there is a demonstrable demand for it and only as fast as it can meet some rudimentary cost-effectiveness criteria. We would all have been appalled back in 1935 if anyone had laid out for us what it would cost to equip all American homes with television sets and their associated programming capabilities (i.e., the total 1974 investment in sets, the major networks, production studios, local stations, repair services, etc.). Our first reactions, after recovering our powers of speech, probably would have been: "How utterly wasteful! Expletive deleted! Could it possibly be worth it? Who on earth is going to pay for all that?"

There was no widespread national debate over whether television should or should not be introduced. There was no national outcry saying we must have television. Considerable time passed (and a great deal of RCA's money was spent by David Sarnoff) before television became even minimally cost-effective. Yet now, by that mysterious and magical process known as the American free enterprise system, television has become deeply embedded in American culture, affecting every aspect of our lives, often in ways we only dimly perceive. We will never know, for instance, but it would be fascinating to try to construct, what the history of the Watergate scandals would have been without the electronic media, especially without television. Richard Nixon may have his grievous faults, but his perception that telecommunications technology should stand high on his list of enemies is quite correct.

The history of other technological innovations, such as the automobile or the telephone, is roughly similar to that of television -- a slow start with almost no cost-effectiveness; a gradual spread as a "need" is either discovered or created; and eventual acceptance on a wide scale as everyone comes to treat the new invention as a necessity of life. Most of us would have difficulty imagining how we would function without the automobile and the telephone.

The basic economic question is not whether any more of the gross national product should be spent in the furtherance of communications technology. The question, as always, is whether we choose to make such an investment in the light of other needs. Is the development of ever more advanced communications systems to be selected over, say, the search for new sources of energy to replace our disappearing supply of fossil fuels? Or increasing our agricultural productivity so that we might have a chance of helping to feed the starving peoples of India and Africa? Or solving our problems of poverty and social injustice? Or finding a cure for cancer? Or constructing for ourselves the basic laws of human development?

These, of course, are not solely questions of economics, but of social -- and even moral -- policy. It has been estimated, for instance, that the average American television set is in use for six hours of every day, most likely turned to the commercial networks. Some advanced telecommunications thinkers envision the day when, through two-way, interactive systems, that six hours may be doubled. New town planners are now installing the capacity for such systems. New town planners also talk about attempting to establish a greater sense of "community," of restoring to American life some measure of productive contact between human individuals -- thus the move towards such things as school/community centers that can perhaps bring to this country some of the social cohesion supplied for the English by, among many other things, their pubs. It is not clear how this sense of "community" is to be engendered by and for people who are interacting with their television sets for twelve hours a day. Instead of devising ever more complicated and time-consuming ways of using cable technology, it is possible that new town planners should be thinking of ways of reducing the present six hours to three.

There are, too, the many possible dangers to human privacy involved in the present and especially in the advanced forms of telecommunications. Electronic eavesdropping and computerized data banks are making more and more people very nervous and wary of potential abuses that could develop right along with a more sophisticated communications system. There is the possibility that two-way interactive communications could slip, with our hardly noticing it, into a system that could monitor an increasing range of human activity, bringing 1984 and Big Brother to us approximately on schedule.

Perhaps the ultimate question raised by -- but hardly limited to -- telecommunications technology is the problem of foresight and control. It is the same problem that is involved in the rationale for new towns themselves in the area of environmental quality, urbanization and the use of our remaining open land. It is the question that lies behind our food problems, our energy problems, our pollution problems, and so on. To what extent can modern, technological man exercise foresight and exert control over what he is doing and where he is going? Is it possible for us, by taking thought and by employing all of the technological skills we now possess, to make more or less conscious decisions about the kind of world we are shaping for ourselves, both as individuals and as a species? Although most of us would fervently hope that we are capable of such foresight, there are many who would reluctantly say that it cannot be so, that the Great Machine of human history, once set in motion, cannot be slowed or altered in its course. The problems we face are too complex and difficult, the human animal too intractable, the forces of technological change and historical movement too strong to be amenable to the exercise of reason. In short, the inexorable laws of natural selection are spelling out for us the course of our eventual extinction as a species. Just as the dinosaur could not respond to large changes in his environment, could not adapt his body and his nature to new and more complex requirements imposed by the course of a history beyond his control, we too will not be able to respond and adapt.

All this is quite possible. There is, however, one important distinction between ourselves and the dinosaur. Our brain is more complex and theoretically more powerful. Whether we like it or not, we are both the product of and the producers of a complex technological apparatus created by that brain. Whatever powers we possess are the result of intellectual and not physical prowess. If we are able to stave off the fate of the dinosaur, it will only be through the exercise of our intellectual faculties and the tool systems that have brought us to this delicate point in our evolution. It seems clear, for instance, that we are not going to solve our energy problems solely by conserving our dwindling supply of fossil fuels, by doing with less and less until it and we are exhausted. The ultimate answer to our energy problem is technological -- the application of increased scientific inquiry and the development of new energy systems not based upon sources that can be used up. Much the same course of action would seem to be required in areas such as food production and the control of pollution.

Our most critical problems, unfortunately, require a great deal more than technological ingenuity. The control of the human population is not simply a matter of more efficient birth control technology, although that will help. A more equitable distribution of the world's food supply -- indeed, of the world's available wealth -- will not come about because of some space-age Tom Edison working in his laboratory. Nor will our problems of urban sprawl, land wastage and unlivable central cities be solved by the creation of a few high class real estate ventures called "new towns."

What is going to be required for human survival is, most likely, some quite different form of human society and certainly a quite different approach to the ways we employ our technological resources. We will, for one thing, have to avoid technological lunacies such as the proposal reported recently in the New York Times by "a group of physicists, astronauts and space flight technologists" to build self-sufficient human colonies in space, balanced between the gravitational pulls of the earth and the moon. Such an ultimate "new community" for 10,000 people would, the scientists pointed out, "provide an alternative to earth if the earth's resources ever reached a point of depletion" and, "in a world threatened with nuclear devastation or catastrophic pollution effects, the stations would provide insurance for the continuity of the human race and other life forms." Having destroyed the earth, we would presumably retreat to our new town in the sky secure in the knowledge that we would be forever safe from all those human foibles and inadequacies that had made it impossible to keep ourselves from obliterating the human community on this planet.

More to the point, we will have to begin to judge our technological possibilities by some rigorous standards of human usefulness. Rather than mindlessly pursuing each new technological dream as it presents itself, we will have to begin to perform some exacting intellectual operations to determine if our proposed innovations will genuinely contribute to solving the overpowering problems that face the human race. Only if an innovation passed some set of rigorous proofs of potential long-term usefulness would the economic resources be made available for the development of new technology. The burden of proving usefulness would, of course, be on the proposers of the innovation. The simple desire of private entrepreneurs to become wealthy might be considered necessary or inevitable but hardly sufficient.

Judged by such criteria, could advanced telecommunications, and especially the proposed two-way interactive cable system, pass the tests? To what extent might the cable industry be able to demonstrate that such improved capabilities would actually promote the general welfare of the species? Assuming for a moment that education does assist the general welfare, is it possible to demonstrate -- or even to project -- possible ways in which telecommunications could make a truly effective contribution to the quality of learning?

We have no firm answers to these questions yet. We have not performed the crucial experiments. It is perhaps too early in the game to hazard guesses about the ultimate usefulness of cable telecommunications in a field such as education which, without any assistance from outside sources, is in and of itself vastly confused. Perhaps the wisest thing we can do is to keep close track of what is actually happening and to think long and hard before making irreversible commitments.

VII.

The View from Now

VII.

The View from Now

It seems clear -- if anything in this field can be called clear -- that telecommunications and education are engaged in a wary and cautious mutual courtship. Each side sees the other as a possible helpmate, but neither is quite sure what marriage would be like.

The educational side worries that the telecommunications people, for all their glamour, may be little more than fortune hunters. Burned by a trial marriage or two in the past, the school people are not about to be taken in once again by a fast-talking smoothie who promises them a brave new world but who might end up lavishing what remains in the depleted family coffers on a series of technological pipe dreams.

The telecommunications people, on the other hand, have great difficulty understanding the bashful behavior of schools. It seems obvious to people who understand the inner workings and the potential marvels of wires, cameras and cables that telecommunications can be -- indeed, already is -- an educational tool of unlimited possibilities, all of them desirable and some of them eventually less costly and more efficient than our conventional ways. True, some money will have to be spent, but the eventual rewards will be incalculable.

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The outcome of this mating dance will probably depend on factors outside the field of education itself, most particularly on the future of telecommunications in the society as a whole. Few school systems are going to set up their own community cable systems. The question so far has been faced seriously only in those situations where a particular community is being cabled for the quite non-educational reason of making a profit for a private cable company. This is happening in many places, but not at a pace that could be called frightening. Indeed, the cable industry appears to be in a somewhat dubious financial situation at this particular moment in time. The rapid expansion of cable and the consequent large profits have simply not materialized. A spirit of retrenchment and reexamination is abroad in the land of telecommunications. To add further to the confusion, the White House Office of Telecommunications Policy recently issued a report floating a set of possible recommendations suggesting that the federal government essentially get out of the business of regulating the cable industry (and thus no longer requiring that specific channels be set aside for public and educational use). Telecommunications is not a field for those people who are happy only with clear, definite answers to life's most pressing problems.

It is probably safe to say that for the immediate future the prospects of rapid, widespread cabling are going to be modest and much slower than predicted, especially in the larger urban areas with acceptable open broadcast reception. It is also reasonable to predict that there will not, in the immediate years ahead, be large sums of money available for the creation of either elaborate instructional hardware systems or the production of the enormously expensive software libraries that would be required to make the hardware usable.

It seems equally clear that most new towns are going to be cabled -- or are going to have cable laid even if the actual uses to which the cable will be put are not totally worked out. It therefore seems a reasonable assumption that most new town developers and their local school districts will be faced with the question of the best ways to use the cable. And it is also a reasonable assumption that new towns and their school districts are logical candidates to explore some of the more intriguing aspects of cable use.

What all this may mean for the long-range future of educational telecommunications is impossible to say at the moment. Indeed, those longer range uses may well depend, in part at least, on what emerges from the new town experience.

The Best Available Advice

Even though the future is cloudy at best, there are some minimal steps developers and particularly local school districts should and should not take:

A. Proceed with attentive caution.

There are not going to be any quick or magic answers, but the questions cannot and should not be ignored. This means that the local school district should be included in -- and should, if necessary, insist on being included in -- all discussions about the cable system and its future uses. The district should thus be involved in any and all negotiations with potential franchise operators. The local system should, for instance, involve itself in the preparation of its municipality's cable ordinance. An additional and minimal precaution would be to make sure that all educational and public spaces should be provided with conduits, thereby making it possible to cable with relative ease and economy.

B. All options should be kept open.

This means that the school district and the developer should make certain minimal demands on the franchise operator, such as:

1. All schools and other public and community spaces should be connected to the cable.
2. Origination studios and equipment should be provided in a place or places which will also be serving as community centers so that everyone has easy access to the cable.

C. The best way to start may not be with instruction but with production.

Instruction via the cable (unless it comes in free from some outside source) is too complicated, costly and unclear at the moment to serve as the most productive *initial* way of using the cable. A more productive approach in the early stages may well be to begin to explore the possibilities and the economics of getting teachers and students (and community people) involved in the use of the cheaper and simpler form of the telecommunications equipment in the production of local programming for distribution over the cable. This means working out joint ways of funding the purchase of Porta-Paks and their associated equipment and developing ways of training teachers and students to use them.

D. The use of telecommunications technology should be built in as part of the regular school curriculum.

If learning how to use telecommunications is thought of as an interesting sideline or elective, then clearly the costs are going to be viewed as "added-on" to the school budget and will have great difficulty being funded. If, on the other hand, the cable and its associated equipment are seen as part of the regular curriculum, then the costs both of equipment and teachers can be handled as a part of the existing school budget.

In other words, telecommunications has to be viewed as just another -- but perhaps an unusually effective -- way of educating students (and adults).

This, of course, will involve some careful planning and experimentation and some fairly large-scale changes in the ways new town schools function. It means training teachers and students to think of "learning" in quite different terms from the traditional reading books and sitting in classrooms approach. It means thinking of the entire community -- its municipal operations, its business and industrial sectors, its community functions and all of its arts and cultural resources -- as the classroom, as an active part of the educational system, as legitimate parts of what is to be studied, learned about and experienced.

This also means that students will "learn" English grammar and Elizabethan history through producing and taping Shakespearean drama and broadcasting it over the cable. It means "learning" civics and social studies by covering the town council meetings live and by producing documentaries on municipal and community problems. It means learning science by studying and filming the environment and dealing with problems of pollution, land development and natural resources and broadcasting the result over the cable.

If some of these connections between schools and the rest of the world can be developed because of and through cable telecommunications technology, perhaps this particular technological advance can avoid becoming the next SST.

Appendix A

Participants in the Educational Technology in New Communities Conference

Participants in the

Educational Technology in New Communities Conference

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Appendix B

Sources of Further Information

Sources of Further Information

General Sources

ALTERNATE MEDIA CENTER
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CABLE TELEVISION INFORMATION CENTER
The Urban Institute
2100 M Street, N.W.
Washington, D.C. 20037
(202) 872-8888

CHILDREN'S TELEVISION WORKSHOP
1 Lincoln Plaza
New York, New York 10023
(212) 595-3456

FEDERAL COMMUNICATIONS COMMISSION
1919 M Street, N.W.
Washington, D.C. 20554
(202) 632-6312

JOINT COUNCIL ON EDUCATIONAL TELECOMMUNICATIONS
1126 Sixteenth Street, N.W.
Washington, D.C. 20036
(202) 659-9740

NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS
1101 Dupont Circle Building
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 785-1100

NATIONAL CABLE TELEVISION ASSOCIATION PUBLIC AFFAIRS DEPARTMENT
918 Sixteenth Street, N.W.
Washington, D.C. 20006
(202) 466-8111

NATIONAL EDUCATION ASSOCIATION
1201 Sixteenth Street, N.W.
Washington, D.C. 20036
(202) 833-4000

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Particular Sources

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Armsey, James W., and Norman C. Dahl. An Inquiry into the Uses of Instructional Technology. New York: The Ford Foundation, 1973. 113 pages.

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Committee on Telecommunications. Communications Technology for Urban Improvement. Washington, D.C.: National Academy of Engineering, 1971.

Community Information Systems Inc. The Jonathan Chaska Community Information System Experiments (final report). Washington, D.C.: U.S. Department of Housing and Urban Development. June, 1973.

Federal Communications Commission. "Cable Television Report and Order," The Federal Register, Volume 37, Number 30, Part II, February 12, 1972. (Available as Section 76.301 from the Government Printing Office, Washington, D.C. 20402.) $.20.

_____. "Reconsideration of Report and Order on Cable Television Service," The Federal Register, Volume 37, Number 136, Part II, July 14, 1972.

**_____. "Clarification of the Cable Television Rules and Notice of Proposed Rule Making and Inquiry," April, 1974. Available through Vincent J. Mullins, Secretary, Federal Communications Commission.

**Levine, Toby H. THE HERE, NOW and tomorrow OF CABLE TELEVISION IN EDUCATION...a planning guide. Boston: Massachusetts Advisory Council on Education. September, 1973. 63 pages, no charge.

Comprehensive, readable, especially good basic primer for educators and community people beginning to consider and to plan for the advent of cable.

National Cable Television Association. Cable Television and Education: A Report from the Field. Washington, D.C., March, 1973.

Sloane Commission on Cable Communications. On the Cable: The Television of Abundance. New York: McGraw-Hill, 1971.

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Appendix C

A Way to Begin

A Way to Begin

The following set of directives and issues was prepared by the Massachusetts Advisory Council on Education for a planning guide entitled THE HERE, NOW and tomorrow OF CABLE TELEVISION IN EDUCATION. The questions indicate the complexity and range of problems new community and educational planners should consider when determining their involvement with cable and setting their standards for a franchise agreement. The preparation of a franchise agreement with provisions that will serve a specific locality's educational interests effectively is no easy task. The task is even more difficult for embryonic new towns only just beginning to attract residents and to develop a sense of community.

Process

1. Form a community-wide Educational Advisory Committee. Seek representation from:
    - Public school committees and boards of trustees of private schools
    - School superintendents and headmasters
    - Principals
    - Teachers association
    - Media and/or communications departments of local colleges
    - Curriculum coordinators and/or planning groups

- Audiovisual coordinators
- Librarians/media and information specialists
- Parent teacher associations
- Student groups
- Community educational groups

Select one or more members to represent the committee on the Issuing Authority's Cable Advisory Committee.

2. Study Procedural Regulations established by the Issuing Authority, noting at what points it is particularly appropriate and important to make educational needs known.

3. Complete Basic Municipal Information form.

4. Complete Current Status of Cable in Municipality form.

5. Complete Educational Community Assessment form.

6. Summarize information gathered in (5) to form a list of immediate needs, long-term needs and desirable features, justifying each.

7. Discuss in committee and formulate options for
    - Allocation of access channel time
    - Use of studio facilities
    - Teacher awareness of cable potential
    - Acquisition of programs for cablecasting
    - Funding of educational program production

- Evaluation of use and effectiveness of educational access channel
- Long-range identification of programming needs
- Reviewing new technological developments
- Coordinating with other educational groups in region, particularly adjacent communities
- Overseeing completion of cable system as contract specifies
- Combining media libraries
- Standard TV specifications to be included in all plans for new educational facilities
- Budgeting recommendations for extension of adequate TV service to existing buildings
- Coordination with cable manager

Basic Municipal Information

(1) Municipal Government Head:
identifies the Issuing Authority

Mayor______________________________________
(or)
City Manager_________________________________
(or)
Board of Selectpeople (Star Chairperson)

____

____

____

Items (2) through (5) determine the basic economic viability of a cable system. In general, a community with a high density and a low percentage of underground wiring has the best opportunity to be economically successful.

(2) Number of Street Miles:
Source: Scaled Street Map

____

(3) Number of Occupied Housing Units:
Identifies total potential subscriber base of cable system.
Source: U.S. Census, Door-to-Door Survey

____

(4) Density:
Occupied Housing Units/Street Miles

____

(5) Type of Wiring:
Source: Utility Company Strand Maps

____ % Aerial

____ % Underground

Items (6) through (9) relate to the general need within the municipality for cable. If few channels are received and/or reception is poor because of topography of area, the potential for high subscriber participation is good.

(6) List commercial television stations normally received without cable. Note channels whose clarity of reception is poor.

____

____

(7) List noncommercial educational stations normally received without cable.
Lack of station indicates possible educational need for cable.

____

(8) List noncommercial educational stations received by microwave signal or through an ITFS system.

____

____

(9) Note areas of municipality where reception is generally poor due to topography or presence of high buildings blocking signal. Using census tract breakdowns from U.S. Census Bureau, estimate what percentage of the population lives in such areas.

Current Status of Cable in Municipality

(1) Has Cable license been granted?
_____yes _____no
If no, skip to Item (30)

Answers to Items (2) through (29) can be found in the franchise document (a matter of public record), from the Issuing Authority or from the cable system owner unless otherwise indicated.

(2) Describe type of ownership (e.g., private, municipal, nonprofit, etc.):

(3) Owner: _______________

(4) System Manager:
Individual you are most likely to need to talk to on a day-to-day basis.

(5) In what other communities in the state has franchisee been granted or applied for license?
Get in touch with people in other communities to see what their experiences with franchisee have been.

(6) Date of Contract:
If prior to 3/31/72, FCC regulations do not apply.

Items (7) through (9) may explain why a franchised system has not been built and/or indicate that all franchise issues are still negotiable.

(7) Has contract been reviewed by the Issuing Authority?

____

If yes, find out what issues are pending.

____

____

(8) Has Certificate of Compliance been received from the FCC? ______________________________

If no, why not? ______________________________

____

(9) Is license currently being challenged for any reason?

____

If yes, find out why from the Issuing Authority.

____

Items (10) and (11) relate to possible areas for renegotiating franchise.

(10) Length of Contract:
FCC now requires 15-year maximum

____

(11) Note any provisions in contract for renegotiation and/or monitoring of franchise by municipality.

____

____

(12) Has franchisee fulfilled contract obligations regarding areas to be wired and timetable for construction? ____
If no, schools may still be included through renegotiation. Further, any items that franchisee has agreed to contractually but not fulfilled may be cause to challenge the license.

(13) Describe current construction status of system.

____

____

Items (14) through (17) indicate the current economic success of the system.

(14) Current Number of Subscribers: ________________

(15) Installation Charge: ________________

Multiply by Item (14): ________________

(16) Monthly Service Charge: ________________

Multiply by Item (14), then by 12 months for annual revenue: ________________

(17) Additional Charges and Number of Subscribers Affected (e.g., second set connections, special services):

____

Add to figure in Item (16) ________________

Items (18) through (29) relate to services offered by cable system.

(18) Channel Capacity: ________________

(19) If under 20 channels and municipality is in a top-100 market, what plans does franchisee have for meeting FCC requirements on minimum channel capacity by March 31, 1977?

____

____

(20) Commercial television stations carried by cable?

____

(21) Noncommercial educational stations carried by cable?

____

(22) What local access channels have been dedicated?

Public Access ____________________

Educational Access ____________________

Local Government Access ____________________

Leased Access (Note cost of leasing channel) ________

____

(23) If no access channels have been dedicated and system is in a top-100 market, what plans does franchisee have for meeting FCC requirements on access channels by March 31, 1977?

____

____

(24) If access channels have been dedicated, what individual or group is responsible for programming and what rules for use exist?
The FCC requires franchisees to maintain lists of all requests for time on access channels.

Public Access: ____________________

Educational Access: ____________________

Local Government Access: ____________________

Leased Access: ____________________

(25) What programming does franchisee originate?
Systems licensed after 3/31/72 with more than 3,500 subscribers must originate local programming.

____

____

(26) Does cable system maintain studio facilities or have arrangements to use studio facilities? ________

Where? ____________________

Equipment Available: ____________________

Creative Personnel Available: ____________________

Technical Personnel Available: ____________________

(27) Is there a charge for using these facilities? Productions under 5 minutes must be free.

____

(28) Does or will the franchisee provide training in videotape production? ____________________

(29) Will franchisee lend portable production equipment to schools? ____________________

If No License Has Been Awarded:

(30) Has Cable Advisory Committee been formed? ________

Membership: ____________________ (Chairperson)

____________________ (Educational Representative)

____

(31) Is Issuing Authority and/or Cable Advisory Committee aware of state procedural regulations?

____

(32) Is Issuing Authority actively soliciting license applications? ____________________

(33) Have any license applications been received? ________

From whom? ____________________

Have they been denied? ____________________

Is action pending? ____________________

(34) If applications have been received but action on them has not yet been taken, it is time to act quickly. Review items (2) through (29) against each license application and complete educational needs assessment so that specific recommendations for negotiation can be made to Issuing Authority. Check cable status (both educational and municipal) in contiguous communities to determine possibilities for interconnection.

Educational Needs Assessment

(1) To identify maximum number of educational buildings on an ideal cable network, obtain a street map of the community and note the location of all public and private, local and regional

- Preschools
- Elementary Schools
- Junior High or Middle Schools
- High Schools
- Vocational Schools
- Technical Schools
- Junior Colleges
- Colleges
- Libraries
- Others (Museums, Adult Education Centers, Historical Societies, Arts Centers, Drop-In Centers, Store Front Learning Centers, Penal Institutions with Educational Programs, etc.)

Items (2) through (27) should be answered by the head administrator in each building noted above. Interlinear comments relate to how advisory committee might interpret answers.

(2) Name of Building: ______________________________

(3) Public or Private: ______________________________

Cable operators have no responsibility to hookup private buildings. Consider asking Issuing Authority to designate all public schools and libraries and private, nonprofit educational buildings for minimum of single drop and single outlet. To provide for service to buildings which may not yet be constructed, this provision should be for length of the franchise agreement.

(4) Address of Building:

____

Is building on a residential street? ____________
If not, it may not be on the cable route.

(5) Chief Administrator and/or Delegate for Cable Planning:

____

(6) Total Number of Students: ______________________

(7) Grade or Age Range of Students: ____________________

Items (8) through (15) relate to the building structure, identify its current internal wiring status and requirements for internal wiring to provide complete cable service.

(8) When was the building constructed? ____________________
Old buildings may be difficult and/or terribly expensive to wire. Most new buildings are being constructed with television wiring in mind.

(9) Describe existing plans and timetable for major renovation, additions or reconstruction.

____

____

(10) Do plans qualify for reimbursement funds under the state building assistance program?

____

(11) Do such plans include internal wiring for television?

____

Schools identifying plans in (9) should probably not consider internal wiring until the time of construction.

(12) If cable franchise has already been granted by municipality, has building been connected?

Single Drop and Outlet: ____________________

Drop and Outlet per Floor: ____________________

Total Internal Wiring: ____________________

(13) If building is not connected to a cable system, is it internally wired for other television service?

Recent wiring may make hookup to community cable easy. Older systems will probably need additional amplifiers to boost signal. Each building in this category should be checked by a systems engineer.

Closed Circuit: ____________________

Master Antenna: ____________________

ITFS: ____

Other: ____

When was wiring installed? _________________________

Items (14) through (16) identify needs of buildings in which there is currently no internal wiring. For a full assessment, a systems engineer should be employed and a cost estimate furnished.

(14) Number of Floors: ______________________________

(15) Attach layout and dimensions of each floor.

(16) On layout, note all locations where outlets for cable reception is desirable. Circle those of lesser priority. The total number of locations identified in Item (16) will provide a rough cost estimate for internal wiring. Industry's figures range from $40-$100 per outlet.

Items (17) through (20) identify the current use of audiovisual materials in schools. The interpretation of these answers is at best subjective. Answers will indicate general sophistication of schools vis-a-vis using a variety of instructional media. Consider also that with a full cable system the storage and distribution of a great deal of audiovisual equipment might be eliminated or at least centralized. Likewise, the storage and distribution of audiovisual materials would be centralized. Further, through a centralized cable distribution system, budgets from different educational interest groups might be combined for maximum implementation.

(17) Audiovisual Equipment

	Type	Number	Age	Condition	Frequency of Use Per Classroom
Film Projectors					
Slide Projectors					
Videotape Recorders					
Videotape Players					
Audio Tape Recorders					
Record Players					
Overhead Projectors					
Television Receivers					
Black and White					
Color					
Radios					
AM					
FM					
CAI Terminals					
Language Laboratories					

(18) Identify how each of these items of equipment is stored and distributed (e.g., in each classroom, in media library in building, in centralized system library).

Film Projectors ____________________
Slide Projectors ____________________
Videotape Recorders ____________________
Videotape Players ____________________
Record Players ____________________
Overhead Projectors ____________________
Television Receivers
  Black and White ____________________
  Color ____________________
Radios
  AM ____________________
  FM ____________________
CAI Terminals ____________________
Language Laboratories ____________________

(19) Audiovisual Materials

	Type	Number	Age	Condition	Frequency of Use Per Classroom
Films					
Slides					
Videotapes					
Audiotapes					
Filmstrips					
CAI Programs					
Records					

(20) How much money per year is budgeted for the purchase of audiovisual material? ______________________
For audiovisual equipment? ______________________

Items (21) through (25) identify situations which may help cable programming get off the ground.

(21) Does building have television production and/or recording facilities? ______________________
Identify type and amount of production equipment.

____

____

Identify type and amount of recording equipment.

____

____

Identify type and amount of playback equipment.

____

____

Identify production personnel.

____

____

Identify technical personnel.

____

____

(22) Does building have audio production and/or recording facilities? ______

Identify type and amount of production equipment.

______

______

Identify type and amount of recording equipment.

______

______

Identify type and amount of playback equipment.

______

______

Identify production personnel.

______

______

Identify technical personnel.

______

______

(23) Do any individuals connected with building (include administrators, teachers, students, parents and paraprofessionals) have experience in videotape production? How much and what type? ______

______

Are they capable of training others? ______

______

(24) Are there institutions within ten miles offering courses in media or communications that include videotape production? ______________________________

____

Can the school system help subsidize training? ________

Can the school system arrange for inservice training of personnel? ______________________________

(25) If school provides student teaching positions to local colleges, can course vouchers be used for production courses? ______________________________

Will system grant graduate credit for same? ________

Can you identify any teachers who might wish to take such a course? ______________________________

Items (26) and (27) identify needs for educational access programming and channel time allocation.

(26) At what hours is instructional television most likely to be used?

Time	Grade	Subject Matter

(27) Identify particular curricular, informational or communicational needs that might be met by locally produced programming.

____

____

____